

Final
**Environmental Assessment for
Developing Renewable Energy Enhanced Use Lease
Facilities at Robins Air Force Base**



78th Civil Engineer Group
Robins Air Force Base, Georgia

December 15, 2013

FINDING OF NO SIGNIFICANT IMPACT (FONSI)
DEVELOPING RENEWABLE ENERGY ENHANCED USE LEASE FACILITIES
AT ROBINS AIR FORCE BASE

In accordance with the National Environmental Policy Act (NEPA) of 1969 (42 U.S. Code [USC] 4321 et seq.), and pursuant to the Council on Environmental Quality's *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* (40 Code of Federal Regulations [CFR] Parts 1500-1508, as of July 1986), and Air Force regulations for the Environmental Impact Analysis Process (32 CFR 989), the 78th Civil Engineer Group, Sustainment and Restoration (78 CEG/CEIER) has prepared an Environmental Assessment (EA) to identify and evaluate the impacts of developing renewable energy generation Enhanced Use Lease (EUL) facilities at Robins Air Force Base (AFB). The EA is incorporated by reference.

PURPOSE AND NEED

The purpose and need of the Proposed Action is to develop renewable energy generation EUL facilities on Robins AFB to comply with Federal mandates and in accordance with the *U.S. Air Force Energy Strategic Plan*. In leasing the land to a private renewable energy developer, the Air Force also is meeting its strategic goal of optimizing the value of its existing lands. (EA Section 1.2)

PROPOSED ACTION

The Proposed Action is to develop a solar photovoltaic (PV) array on a leased parcel of land of approximately 20 hectares (50 acres) in size located on the southwestern portion of Robins AFB. The Air Force has determined that this parcel of non-excess land is suitable for an EUL agreement. Under the lease agreement, a developer would install, operate and maintain the solar PV array and sell the power to Georgia Power. The Air Force would receive fair market value rental payments in cash and/or in-kind consideration from the lessee.

The EUL Parcel is located near electrical transmission lines owned by Georgia Power. The solar panels would be ground-mounted and fixed, manually adjustable, or mounted on a tracker to follow the sun's path, depending upon the final design. The facility would be designed and constructed in a manner that is compatible with government uses on adjacent land, and oriented to minimize or avoid reflections that could impact airfield operations or aircraft on approach and departure. At the end of the lease term, the facility would be decommissioned, re-commissioned or a new facility would be installed. (EA Section 2.2)

NO-ACTION ALTERNATIVE

Under this alternative, the proposed solar PV array would not be developed on the EUL Parcel and construction and operation would not benefit the socioeconomic environment, nor comply with Federal mandates. Robins AFB would not realize the benefit from leasing non-excess land for development of the solar PV array. (EA Section 2.3)

ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

Robins AFB considered technology and location alternatives for the proposed development of renewable energy EUL facilities. A preliminary evaluation of renewable energy sources was undertaken to identify technologies that would be capable of meeting renewable energy mandates and also be suitable for implementation on the Base. The evaluation concluded that

the use of solar energy was the most suitable technology for development on Robins AFB. Other potential site locations for the proposed solar PV array were considered, but it was determined that alternative sites are currently being held for other future uses per the Base General Plan, would not be compatible with the mission or force protection needs, were insufficient in size or accessibility, or were less accessible to transmission interconnection points. As such, there are no other reasonable alternatives and none are considered in the EA. The EA evaluates the potential environmental impacts of the Proposed Action and the No-Action Alternative. (EA Section 2.4)

ENVIRONMENTAL IMPACTS

During construction, the Proposed Action would have no adverse impact on floodplains or wetlands, storm water, groundwater, drinking water supply, wastewater, solid waste, hazardous materials and waste, toxic materials or safety at Robins AFB. Construction activities would have insignificant adverse impact on topography, surface water, soils, air quality, the noise environment, the biological environment, cultural resources, and transportation. Construction would have an insignificant beneficial effect on the socioeconomic environment. (EA Section 2.5)

During operation, the Proposed Action would have no adverse impact on topography, surface waters, floodplains and wetlands, storm water, soils, groundwater, air quality, wastewater, solid waste, hazardous materials and waste, toxic materials, the noise environment, the biological environment, cultural resources, safety, or transportation. Operation of the solar PV array would have a minor adverse impact on water supply, and a beneficial effect on the socioeconomic environment. (EA Section 2.5)

Decommissioning of the solar PV facilities would have impacts on the environment similar to those from construction. Further, there would be insignificant adverse impacts on solid waste and hazardous materials and waste. Substantial amounts of solid and industrial waste would result from removal of the solar PV facilities; however, it is expected that the decommissioning would attempt to maximize the recycling of all facility components thereby minimizing the generation of solid waste. Hazardous materials, such as fuel and lubricants, and the solar PV panels, if containing hazardous materials, would be handled in accordance with Robins AFB's *Hazardous Waste Management Plan* (HWMP) and all applicable local, state, and Federal regulations. (EA Section 2.5)

CUMULATIVE IMPACTS

The cumulative effects of the Proposed Action when added to other past, present, and reasonably foreseeable future actions were evaluated and found to be insignificant. Three past actions, two future actions, and three proposed actions were identified as potentially producing cumulative environmental impacts. Evaluation of these projects with the Proposed Action determined that no significant positive or significant negative cumulative impacts on environmental resources would occur. Cumulative effects from the temporary, minor increase in air emissions, waste generation, noise and traffic during construction would be inconsequential and Best Management Practices (BMPs) would be used to minimize adverse effects. It is unlikely that the projects would be constructed simultaneously, further reducing the potential for cumulative adverse effects. During operation, the Proposed Action, when added to the other projects under consideration, would have a cumulative, beneficial effect on the socioeconomic environment. (EA Section 4.9)

PUBLIC NOTICE

A notice of the 30-day public review period was published on September 19, 2013 in the *Houston Home Journal* inviting the public to review and comment on the Draft EA. The State Clearinghouse web site instructions specify sending items for agency review directly to the respective agencies, therefore, a request also was submitted on September 19, 2013 to the following state agencies: State Historic Preservation Office (SHPO), and the Georgia Department of Natural Resources, Wildlife Resources Division and Environmental Protection Division. Further, the culturally-affiliated Native American Tribes were notified by letter of the nature and location of the Proposed Action (and provided a copy of the Draft EA), and comments were requested concerning human remains and items such as religious, cultural, or sacred sites, and related matters. Comments received during the 30-day review periods are addressed in the Final EA. No comments were received. All agency consultation is complete.

FINDING OF NO SIGNIFICANT IMPACT

The Proposed Action involves developing a solar PV array on a parcel of leased land on Robins AFB. Based upon my review of the facts and analyses contained in the EA, which is hereby attached and incorporated by reference, I conclude that the Proposed Action will not have a significant impact on the natural or human environment. An Environmental Impact Statement (EIS) is not required for this action. This analysis fulfills the requirements of the NEPA, the President's Council on Environmental Quality, and 32 CFR Part 989.



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Date: 29 Jan 14

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Final

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Developing Renewable Energy Enhanced Use Lease
Facilities at Robins Air Force Base**

for
78th Civil Engineer Group
Warner Robins Air Logistics Center
Robins Air Force Base, Georgia
Contract No. W91278-10-D-0025, Task Order CV01

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EXECUTIVE SUMMARY

The 78th Civil Engineer Group, Sustainment and Restoration (78 CEG/CEIER) has conducted this Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) to identify and assess potential impacts of the Proposed Action and reasonable Alternatives as described in the following paragraphs.

The purpose of the Proposed Action is to develop renewable energy generation Enhanced Use Lease (EUL) facilities on Robins AFB to comply with Federal mandates and in accordance with the *U. S. Air Force Energy Strategic Plan* (USAF, 2013). The Base is meeting its current renewable energy goal through the Georgia Power Green Energy Program, in which green energy generated elsewhere is purchased by the Base. The Proposed Action is needed to develop a more permanent and secure solution for complying with renewable energy mandates by generating renewable energy on non-excess Base property.

The Proposed Action is to develop a solar photovoltaic (PV) array on a leased parcel of land of approximately 20 hectares (50 acres) in size on Robins Air Force Base (AFB). The Air Force has determined that this parcel of non-excess land is suitable for an EUL agreement. Under the lease agreement, a developer would install, operate and maintain the solar PV array and sell the power to Georgia Power. The Air Force would receive fair market value rental payments in cash and/or in-kind consideration from the lessee.

The EUL Parcel is located near 115 kilovolt (kV) – 161 kV electrical transmission lines owned by Georgia Power. It is anticipated that the solar PV facility would be comprised of solar PV panels and steel or aluminum supporting structures, underground or above ground transmission equipment, inverters, switches, transformers (if needed), maintenance building, access road, and parking area. The solar panels would be ground-mounted and fixed, manually adjustable, or mounted on a tracker to follow the sun's path, depending upon the final design. The facility would be designed and constructed in a manner that is compatible with government uses on adjacent land, and oriented to

minimize or avoid reflections that could impact airfield operations or aircraft on approach and departure. The solar PV array would be decommissioned by the developer at the end of the lease term, or the facility could be re-commissioned.

During construction, the Proposed Action would have no adverse impact on floodplains or wetlands, storm water, groundwater, drinking water supply, wastewater, solid waste, hazardous materials and waste, toxic materials or safety at Robins AFB. Construction activities would have insignificant adverse impacts on topography, surface water, soils, air quality, the noise environment, the biological environment, cultural resources, and transportation, and an insignificant beneficial effect on the socioeconomic environment.

During operation, the Proposed Action would have no adverse impact on topography, surface waters, floodplains and wetlands, storm water, soils, groundwater, air quality, wastewater, solid waste, hazardous materials and waste, toxic materials, the noise environment, the biological environment, cultural resources, safety, or transportation. Operation of the solar PV array would have a minor adverse impact on water supply, and a beneficial effect on the socioeconomic environment.

Decommissioning of the solar PV facilities would have effects on the environment similar to those from construction, with two exceptions. There would be insignificant adverse impacts on solid waste and hazardous materials and waste (see **Table 2-2**). Substantial amounts of solid and industrial waste would result from removal of the solar PV facilities. It is expected that the decommissioning would attempt to maximize the recycling of all facility components thereby minimizing the generation of solid waste. Hazardous materials, such as fuel and lubricants, and the solar PV panels, if containing hazardous materials, would be handled in accordance with Robins AFB's *Hazardous Waste Management Plan* (HWMP) and all applicable local, state, and Federal regulations.

Construction and decommissioning of the solar PV facilities would have insignificant adverse cumulative impacts on topography, surface waters, soils, air quality, noise,

biological resources, cultural resources, transportation and safety. Decommissioning also would have insignificant adverse cumulative impacts from solid waste and hazardous materials and waste generation.

Under the No-Action Alternative, the proposed solar PV array would not be developed on the EUL Parcel. The No-Action Alternative would not benefit the socioeconomic environment (see **Table 2-2**), nor comply with Federal mandates, and Robins AFB would not realize the benefit from leasing the non-excess land for development of the solar PV array.

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APPENDICES

- A Robins AFB Background Information**
- B Agency / Public Correspondence**
- C Solar Glare Analysis**

ABBREVIATIONS & ACRONYMS

5 CCG	5th Combat Communications Group
78 ABW	78th Air Base Wing
78 CEG	78th Civil Engineer Group
78 CEG/CEIE	78th Civil Engineer Group, Environmental Branch
78 CEG/CEIEC	78th Civil Engineer Group, Compliance
78 CEG/CEIER	78th Civil Engineer Group, Sustainment and Restoration
78 CEG/CENPE	78th Civil Engineer Group, Energy Office
94 APS	94th Aerial Port Squadron
116 ACW	116th Air Control Wing
339 FLTS	339th Flight Test Squadron
638 SCMG	638 th Supply Chain Management Group
ACHP	Advisory Council on Historic Preservation
AC	Alternating Current
ACM	Asbestos-Containing Material
AFB	Air Force Base
AFI	Air Force Instruction
AFOSH	Air Force Occupational Safety and Health
AFRC	Air Force Reserve Command
AICUZ	Air Installation Compatible Use Zone
AMFS	Advanced Metal Finishing Shop
ASL	Above Sea Level
ATV	All-terrain Vehicle
BMP	Best Management Practice
C2ISR	Command and Control, Intelligence, Surveillance and Reconnaissance
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH ₄	methane
CO	carbon monoxide
CO ₂	carbon dioxide
CO ₂ -e	carbon dioxide equivalent
CRM	Cultural Resources Manager
dB	Decibel
DC	Direct Current
DLA	Defense Logistics Agency

ABBREVIATIONS & ACRONYMS continued

DLADS	Defense Logistics Agency Disposition Services
DNL	Day-Night Average Noise Level
DoD	Department of Defense
EA	Environmental Assessment
EBS	Environmental Baseline Survey
EIAP	Environmental Impact Analysis Process
EISA	Energy Independence Security Act of 2007
EO	Executive Order
EPAct	Energy Policy Act
ESOH	Environment, Safety, and Occupational Health
ESPC	Erosion, Sediment, Pollution Control
EUL	Enhanced Use Lease
FEMA	Federal Emergency Management Agency
FG	fluorinated gases
FIRM	Flood Insurance Rate Map
ft	foot/feet
FY	Fiscal Year
GAEPD	Georgia Environmental Protection Division
GDOT	Georgia Department of Transportation
GHG	Greenhouse Gas
GPW	General Purpose Warehouse
G-RAMP	Georgia-Robins Aerospace Maintenance Partnership
HC	Halocarbon
HQ	Headquarters
HWMP	Hazardous Waste Management Plan
ICRMP	Integrated Cultural Resources Management Plan
ISWMP	Integrated Solid Waste Management Plan
IWTP	Industrial Wastewater Treatment Plant
kph	kilometers per hour
kV	Kilovolt
LBP	Lead-Based Paint
LEED	Leadership in Energy and Environmental Design
m	meter(s)
MAG-49	Detachment A, Marine Aircraft Group-49
MBTA	Migratory Bird Treaty Act
mph	miles per hour
MSW	Municipal Solid Waste
MW	Megawatt

ABBREVIATIONS & ACRONYMS, continued

N ₂ O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Ac
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NO _x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O ₃	ozone
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
PA	Programmatic Agreement
PCB	polychlorinated biphenyl
PM	Particulate Matter
POV	Personally-Owned Vehicle
PPA	Power Purchase Agreement
PPE	Personal Protective Equipment
PV	Photovoltaic
RACM	Regulated Asbestos-Containing Material
RCRA	Resource Conservation and Recovery Act
SFF	Security Forces Facility
SGHAT	Solar Glare Hazard Analysis Tool
SHPO	State Historic Preservation Office
SO _x	sulfur dioxide
SWDS	Storm Water Drainage System
SWMU	Solid Waste Management Unit
SWTP	Sanitary Wastewater Treatment Plant
TCLP	Toxic Characteristic Leaching Procedures
UFC	Unified Facilities Criteria
US	United States
USAF	United States Air Force
USC	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish & Wildlife Service
VFR	Visual Flight Rules

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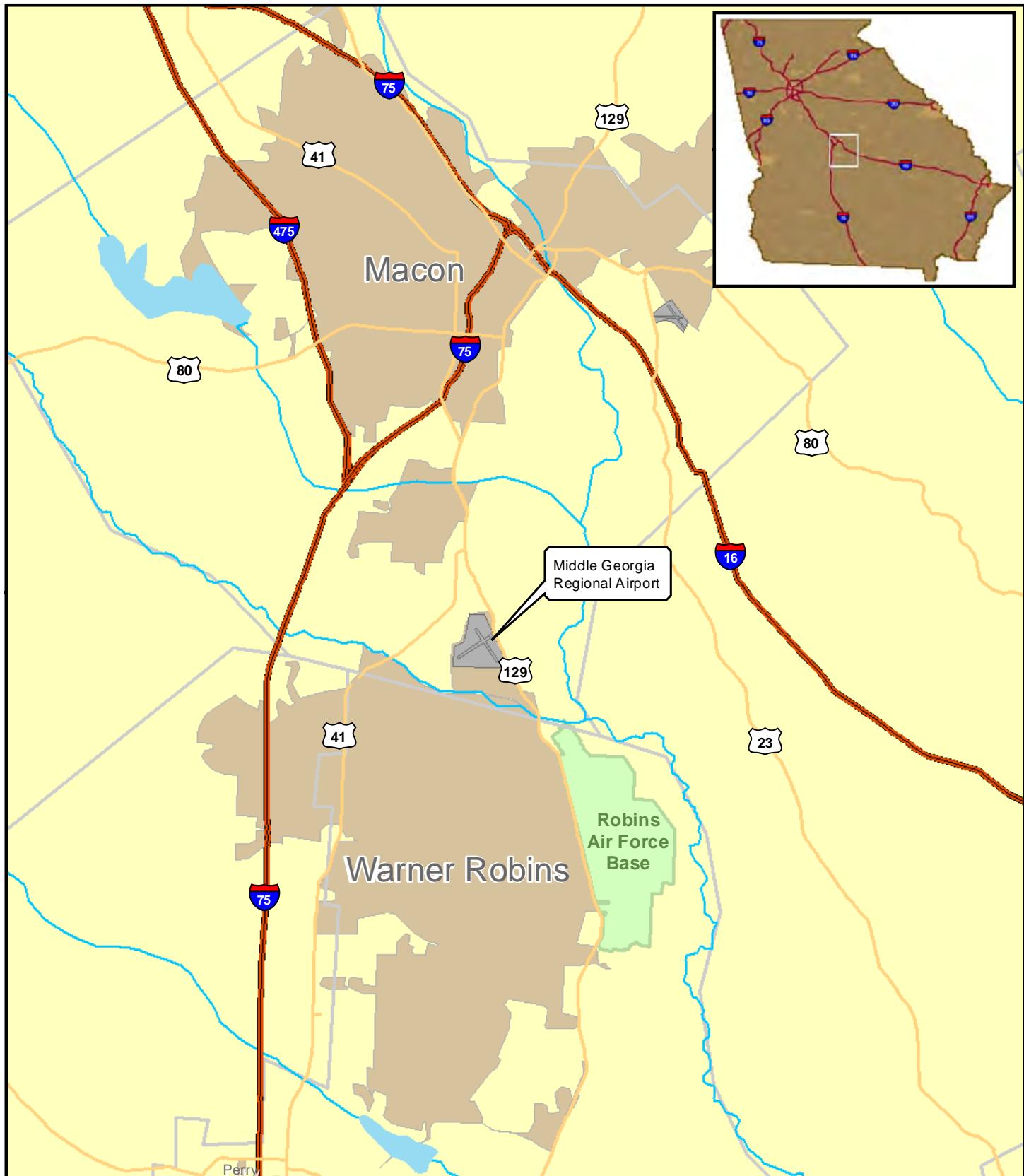
1.0 INTRODUCTION, PURPOSE AND NEED

The 78th Civil Engineer Group, Sustainment and Restoration (78 CEG/CEIER) has conducted this Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) to identify the Proposed Action, alternatives, and the potential environmental impacts associated with the Robins Air Force Base (AFB) solar photovoltaic (PV) array enhanced use lease (EUL) project .

1.1 BACKGROUND INFORMATION

Robins AFB is located in Houston County in central Georgia, approximately 161 kilometers (100 miles) southeast of Atlanta, 29 kilometers (18 miles) south of Macon, and immediately east of the city of Warner Robins (**Figure 1**). The Base encompasses approximately 2,725 hectares (6,733 acres) of land including approximately 1,070,000 square meters (11,500,000 square feet) of building space and employs approximately 24,000 civilian, contractor, and military personnel (Robins Rev-Up, 2013).

Robins AFB provides logistic support to the United States Air Force (USAF) through the performance of maintenance and refurbishment on various fixed winged aircraft, helicopters, remotely piloted vehicles, missiles and other aircraft. Robins AFB hosts more than 60 tenant units. Associate organizations include the 94th Aerial Port Squadron (94 APS), 116th Air Control Wing (116 ACW), 339th Flight Test Squadron (339 FLTS) “Rogues”, 638th Supply Chain Maintenance Group (638 SCMG), Detachment A, Marine Aircraft Group-49 (MAG-49), 5th Combat Communications Group (5 CCG), Defense Logistics Agency (DLA), Headquarters Air Force Reserve Command (HQ AFRC), and other units. Relevant background on Robins AFB is presented in **Appendix A**



Source: ESRI Base Map

Figure 1
Vicinity Map

1.2 PURPOSE AND NEED

In recent years, concern for the environment and the lack of energy independence in the United States (US) has fueled the passage of several government mandates that have placed stringent energy and environmental goals on Federally-owned facilities (**Table 1-1**). The *Energy Policy Act of 2005* (EPAct 2005) forms the foundation of the Federal policies and sets renewable energy consumption goals for Federally-owned facilities. Since 2005, several Executive Orders (EOs) along with the Energy Independence and Security Act (EISA) of 2007 have amended the initial goals. The *Energy Performance Goals for Department of Defense* (DoD) outlined in 10 US Code (USC) 2911 details the energy performance goals and specific plans for the DoD and requires DoD facilities to produce or procure 25% of total energy consumed from renewable energy sources by Fiscal Year (FY) 2025. The EISA of 2007 mandates annual energy reduction goals for Federal facilities, including a total energy reduction of 30% by FY2015, as compared to consumption in FY2003. The *Federal Leadership in Environmental, Energy, and Economic Performance* (EO 13514) sets goals for reducing greenhouse gas (GHG) emissions, reducing the intensity of water use, and diverting solid waste from landfills. The information presented herein is not an exhaustive list of all mandates, but rather a compilation of the most relevant goals that affect renewable energy procurement and generation at Federally-owned facilities, including Robins AFB.

Table 1-1. Federal Mandates

Description	Goal	Year	Mandate
Renewable Energy (purchase or on-site generation)	≥ 5% of total electricity consumption in that year	FY2010 – FY2012	EPAct 2005
	≥ 7.5% of total electricity consumption in that year	FY2013 and after	EPAct 2005
	≥ 25% of total electricity consumption in that year	End of FY2025 and after	10 USC 2911
Facility Energy Intensity	30% reduction relative to 2003 baseline	End of FY2015	EISA of 2007
Green House Gas	28% reduction relative to	End of FY2020	EO 13514

(GHG) Emissions	2008 baseline		
Water Intensity	26% reduction relative to 2007 baseline	End of FY2020	EO 13514
Non-Hazardous Solid Waste	Divert ≥50%	End of FY2015	EO 13514

Additional notes from these mandates include:

- EPAct 2005 defines “Renewable energy” as **electric** energy generated from solar, wind, biomass, landfill gas, ocean (including tidal, wave, current, and thermal), geothermal, municipal solid waste, or new hydroelectric generation capacity achieved from increased efficiency or additions of new capacity at an existing hydroelectric project;
- Renewable energy sources, including those listed in the preceding definition of renewable energy, used to produce thermal energy (i.e. used as heat source rather than to generate electricity) do not count towards the renewable energy goals (EPAct 2005). Some examples of this include: geothermal heat pumps, solar water heaters, and biomass used to produce steam for district heat;
- Federal Agencies can double count renewable energy if it is produced on-site and used at a Federal facility, produced on Federal lands and used at a Federal facility, or produced on Native American land and used at a Federal facility (EPAct 2005). For the FY2025 mandate, 10 USC 2911 does not specifically mention this bonus; however, it does reference EPAct 2005 as a source for definitions. It is assumed that the ability to double count on-site generation persists in the 25% renewable electricity consumption in FY2025 goal;
- EO 13423 establishes a goal that at least half of renewable energy used by the Federal Government comes from **new** renewable sources. New is defined as put into service after January 1, 1999;
- EISA of 2007 requires 30% of the hot water demand in new Federal buildings and major renovations to be met with solar hot water equipment, provided it is life-cycle cost-effective.

Currently, at least 7.5 percent of the Base’s annual electrical consumption must be procured from renewable sources, and Robins AFB is meeting this goal through a contract with the Georgia Power Green Energy Program. Robins AFB is interested in developing permanent and secure solutions for meeting its renewable energy goals

The Air Force’s purpose and need for the Proposed Action are also driven by requirements to promote the efficient and economical use of real property assets at Robins AFB in accordance with EO 13327, *Federal Real Property Asset Management*.

DoD leasing tools such as 10 USC 2667, *Leases: Non-Excess Property of Military Departments and Defense Agencies*, that allow the Air Force, through its EUL program, to lease non-excess real property for terms that promote the national defense or are in the public interest. In seeking solar energy development, Robins AFB is also pursuing objectives outlined in the 14 February 2007, Department of the Air Force memorandum titled, *Pursuing “Value-Based” Transactions Involving Air Force Real Property Assets*. This memorandum defines organizational responsibilities for Air Force organizations to optimize the value of real property assets using authorized tools such as the EUL program. In leasing the land to a private renewable energy developer, the Air Force is meeting its strategic goal of optimizing the value of its existing lands.

The purpose of the Proposed Action is to develop renewable energy generation EUL facilities on Robins AFB to comply with Federal mandates and in accordance with the *U.S. Air Force Energy Strategic Plan* (USAF, 2013). The four priorities of the Energy Strategic Plan are to improve resiliency, reduce demand, assure supply, and foster an energy aware culture. By reducing energy consumption and increasing the use of renewable energy, the Air Force will improve energy security and reduce GHG emissions. The Proposed Action would support the EPAct and increase overall use of renewable energy toward meeting long-range renewable energy use goals.

The Base is meeting its current renewable energy goal through the Georgia Power Green Energy Program. However, this energy is produced from a landfill methane-to-energy plant about 161 kilometers (100 miles) away at the Seminole Landfill in DeKalb County, Georgia. The Proposed Action is needed to develop a more permanent and secure solution for complying with renewable energy mandates by generating renewable energy from on-Base facilities.

1.3 ENVIRONMENTAL IMPACT ANALYSIS PROCESS

NEPA requires Federal agencies to identify and analyze potential environmental impacts associated with proposed Federal actions and the Proposed Action’s reasonable

alternatives prior to those actions taking place. The intent of NEPA is to facilitate well-informed decisions by providing decision-makers with an understanding of the potential environmental impacts of a proposed action. The Council on Environmental Quality (CEQ) was established under NEPA to develop implementing regulations and ensure Federal agency compliance with NEPA. CEQ has issued regulations for implementing the procedural provisions of NEPA (40 Code of Federal Regulations [CFR] 1500-1508). The Air Force achieves and maintains compliance with NEPA and CEQ regulations through Environmental Impact Analysis Process (EIAP) procedures. The Air Force's specific procedures and requirements are contained in 32 CFR 989, *Environmental Impact Analysis Process (EIAP)*.

NEPA requirements help to ensure that environmental information is made available to the public during the decision-making process and prior to actions being taken. 78 CEG/CEIER provided an opportunity for public and agency review and comment on, the Draft EA prior to completing the Final EA. A public notice was published on September 19, 2013 in the local newspaper, the *Houston Home Journal*, to announce the availability of the Draft EA. The State Clearinghouse web site instructions specify sending items for agency review directly to the respective agencies, therefore review copies of the Draft EA were sent to the following Georgia agencies: the Georgia Department of Natural Resources Environmental Protection Division, Wildlife Resources Division, and Historic Preservation Division, on September 19, 2013. Further, the culturally-affiliated Native American Tribes were notified by letter of the nature and location of the Proposed Action (and provided a copy of the Draft EA), and comments were requested concerning human remains and items such as religious, cultural, or sacred sites, and related matters; no comments were received. Comments received from the public and relevant state agencies during the 30-day review period were incorporated into the Final EA to complete the public comment process. Copies of the public notice and agency correspondence are presented in **Appendix B**.

2.0 PROPOSED ACTION AND ALTERNATIVES

This chapter provides a description of the Proposed Action and those supporting actions the Air Force would undertake to implement the Proposed Action. This chapter also provides a description of alternatives that meet the Air Force requirements for the Proposed Action and sets forth the selection standards that were used to evaluate and develop reasonable alternatives. Alternatives which did not meet the selection standards were considered, but eliminated from further evaluation.

2.1 ALTERNATIVE SELECTION STANDARDS AND PROJECT REQUIREMENTS

This section outlines the alternative selection standards that were used by Robins AFB to develop and then analyze the range of reasonable alternatives. These standards were used to help determine feasibility of alternatives and the extent to which project alternatives would fulfill the purpose and need identified in Chapter 1. The description of reasonable selection standards explains how viable renewable energy technologies for the project were determined and further explains why other technology alternatives were eliminated from more detailed study and comparison.

Several requirements were identified in order to fulfill the purpose and need.

- Meet the definition of renewable as defined by EPAct 2005 and be consistent with relevant EO's and the Air Force Energy Strategic Plan;
- Utilize energy sources that are readily available in sufficient quantities on Robins AFB (i.e., implementation of the technology must be realistic);
- Be reasonably compatible with existing infrastructure on Robins AFB and not require extensive modification of Base-wide utility systems;
- Meet Robins AFB security requirements;
- Not generate excessive GHG or other air pollutant emissions or volumes of solid waste;
- Be reasonably cost effective and acceptable to the public;

- Be located on Robins AFB to eliminate the cost of purchasing land and to qualify for double-counting under EPAct 2005.

Reasonable alternatives also must meet the selection standards below.

- Mission Compatibility - To be carried forward as a viable alternative for analysis, the renewable energy site and technologies considered must be compatible with military and commercial missions occurring on Robins AFB. The Proposed Action also must not interfere with the operations of other bases in the region. Renewable energy proposals which impact execution of Air Force or other military service operations at Robins AFB are not considered a viable alternative.
- Force Protection Compatibility - To be carried forward as a viable alternative, the renewable energy site considered must not compromise Base operations or the ability to implement force protection measures and Base security. Viable renewable energy sites must be located on the perimeter of the installation or in other contained areas, where the developer and Base can monitor and validate the credentials of employees during the development and operation of the solar facility.
- Grid Access, Proximity to Interconnection - Alternative sites considered must be within reasonable proximity to a viable interconnection point to allow access to high voltage transmission lines with the capacity to carry renewable energy generated by the project to customers in need of electricity. Construction of above ground transmission typically can exceed \$1 million per mile when all construction and mitigation costs associated with transmission lines are considered. Excessive construction requirements for electrical tie-in infrastructure would jeopardize the economic and technical feasibility of the project. The grid infrastructure must be capable of transporting or being upgraded to transport electricity generated by the proposal.
- Site Accessibility - Sites must be accessible for workers and equipment to support construction of the renewable energy facility. The renewable energy facility must be in close proximity to existing unimproved or paved roads to ensure the development team can proceed with constructing and operating the facility. The site must have the ability for trucks to bring heavy equipment, supplies, water, and project materials to the site.
- Physical Compatibility of the Site with Solar PV Development – Topography and slope of the proposed siting location must support the proposed solar project. Topography should consist of land which is generally flat and of less than two percent grade. The site must provide for good southern exposure to capture the sun's energy without topography which causes sun blockage or shading.
- Land Availability - The renewable energy site considered must be comprised of at least 50 acres of contiguous, non-excess, Air Force real property suitable for EUL

and capable of generating at least 1 megawatt (MW) of energy. The location cannot be currently held for other future uses per the Base General Plan.

- Cost Feasibility and Commercial Viability - The technology considered must be economically viable. The technology must be consistent with generally accepted commercial and/or utility renewable energy requirements. The technology must be mature and financeable at reasonable market rates.

2.2 PROPOSED ACTION

The Proposed Action is to develop a solar PV array on a leased parcel of land located on the southwestern portion of Robins AFB. The EUL Parcel consists of approximately 20 hectares (50 acres) on a single parcel in the southwest area of the installation. The EUL Parcel is bounded on the north by Marchbanks Drive, on the east by Macon Street, and on the west by the Base boundary and State Route 247 (**Figures 2 and 3**). The Air Force has determined that this parcel of non-excess land is suitable for an EUL agreement. An EUL is a lease of non-excess property, under control of the Federal Government, to a public or private sector lessee in exchange for fair market value rental payments in cash and/or in-kind consideration. Under a lease agreement, a developer would install, operate and maintain the solar PV array and sell the power to Georgia Power.

As part of the Georgia Power Advanced Solar Initiative developed by Georgia Power Company in cooperation with the Georgia Public Service Commission to encourage new solar development opportunities and to increase solar generation in the state, Georgia Power issues a competitive request for proposals to procure utility scale capacity and energy produced by solar PV generating systems. Per Georgia Power's requirements, the system must be a solar PV generating system rated not less than 1 MW and not more than 20 MW; must be connected directly to the Georgia Power transmission or distribution grid, or Georgia Integrated Transmission System; and the full output of energy produced at the solar PV facility must be sold to Georgia Power via a power purchase agreement (PPA).

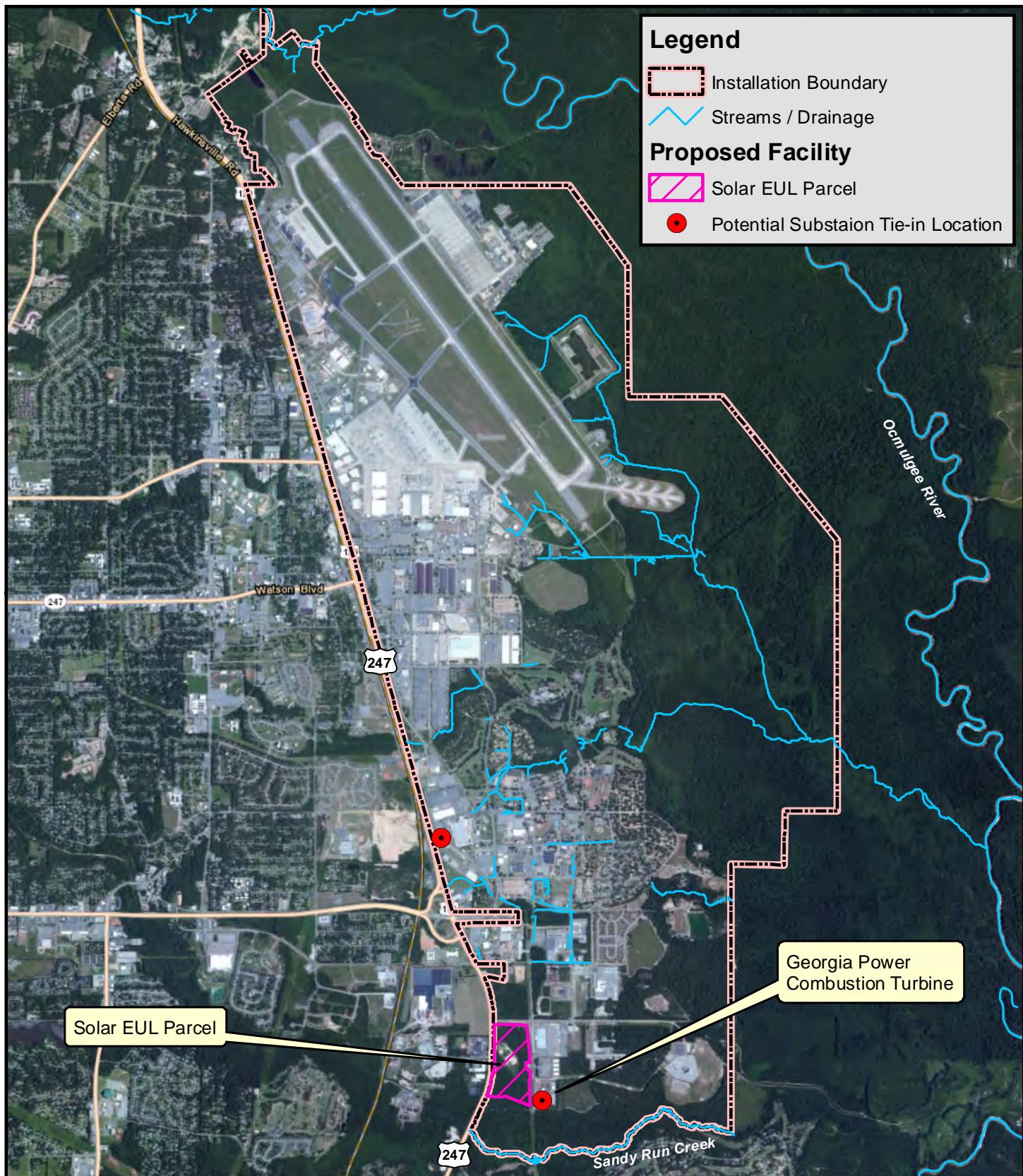


Figure 2
General Location of Proposed Facilities

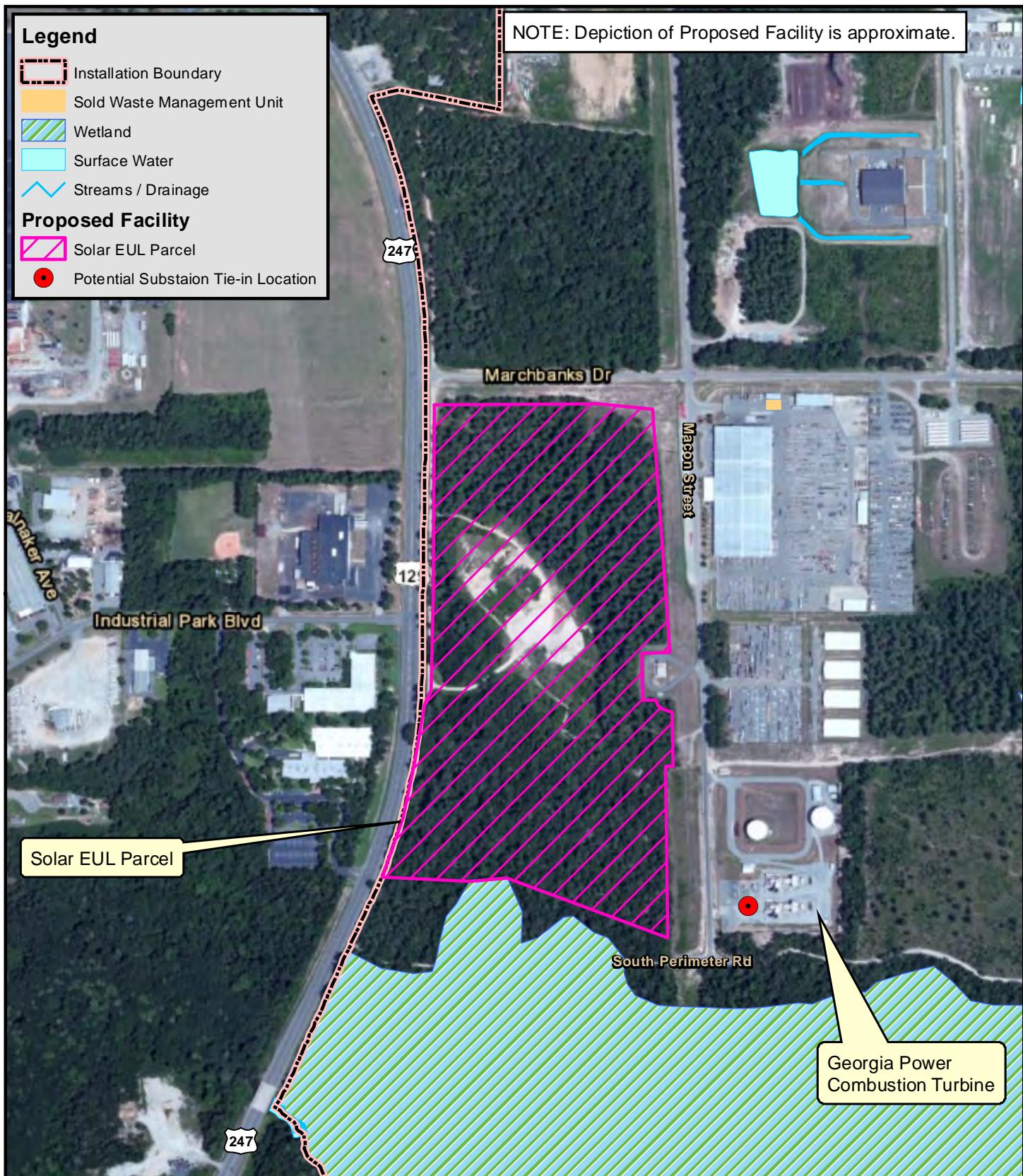


Figure 3
Proposed Facility Area

The proposed facilities would employ solar PV technology, which was developed in the 1950s. Solar cells, also known as PV cells, convert sunlight into direct current (DC) electricity. The DC electricity is converted by an inverter to alternating current (AC) electricity and connected to the power grid or local electrical system for distribution. Traditional solar cells made from silicon are typically in the form of flat plates and are the most efficient solar cells.

Much of the EUL Parcel consists of planted loblolly pine and hardwood forest. Approximately 1.2 hectares (3 acres) in the central portion of the parcel was used as a dirt track and for all-terrain vehicle (ATV) training activities from the 1980s to early 2000 (see **Figure 3**). Presently, the dirt track area is use for stockpiling excess soil generated from other Base construction projects. There is a storage facility adjacent to and immediately east of the EUL Parcel. The Straight Arrow Archery Range is located immediately south of the EUL Parcel. Utilities available on or near the site include sanitary sewer, electricity, water, communications, and natural gas located along Macon Street. The EUL Parcel is located near 115 kilovolt (kV) – 161 kV electrical transmission lines owned by Georgia Power. Electrical transmission lines run along the eastern boundary of the EUL Parcel on the western side of Macon Street, and a natural gas pipeline is located east of the EUL Parcel and Macon Street. The closest tie-in location is an electrical substation located east of the EUL Parcel near the Georgia Power Combustion Turbine, which is located across Macon Street to the east of the parcel (see **Figures 2 and 3**). A second electrical substation is located approximately 1.6 kilometers (1 mile) northwest of the EUL Parcel (see **Figure 2**).

Final design for the facility has not been completed. It is anticipated that the solar PV facility would be comprised of solar PV panels and steel or aluminum supporting structures, underground or above ground transmission equipment, inverters, switches, transformers (if needed), maintenance building, access road, and parking area. The solar panels would be ground-mounted and fixed, manually adjustable, or mounted on a tracker to follow the sun's path, depending upon the final design. The facility would be designed and constructed in a manner that is compatible with government uses on adjacent land,

and oriented to minimize or avoid reflections that could impact airfield operations or aircraft on approach and departure. At the end of the lease term, the facility would be decommissioned, re-commissioned, or a new facility would be installed.

2.3 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, the proposed solar PV array would not be developed on Robins AFB. The purpose and need for the renewable energy facilities would not be met, and the benefits associated with implementation of the Proposed Action would not be realized. Robins AFB's compliance with renewable energy mandates (e.g., EPAct 2005, EISA of 2007, EO 13514, EO 13423, and 10 USC 2911) and the *Air Force Energy Strategic Plan* would need to be satisfied through other renewable energy technology options. The Base would continue to purchase renewable energy through the Georgia Power Green Energy Program or by other commercial purchase and would not realize the benefit from leasing the non-excess land for development of the solar PV array.

2.4 ALTERNATIVES CONSIDERED AND ELIMINATED FROM FURTHER CONSIDERATION

2.4.1 Technology Alternatives

Robins AFB conducted a preliminary evaluation of renewable energy sources to identify technologies that would be capable of meeting renewable energy mandates and also meet the selection criteria (Robins AFB, 2011a). The study compared eight renewable energy sources, including, solar, wood waste biomass, wind, hydropower, geothermal, municipal solid waste, and landfill gas.

Wind, hydropower, and geothermal sources were eliminated because of insufficient sources of energy. Wind power using turbines was eliminated because the average wind speed in Warner Robins, Georgia is 8 kph (5 mph), and wind turbines are typically not cost-effective in areas with average wind speeds below 12.9-16.1 kph (8-10 mph).

Traditional hydropower (i.e., dams) was eliminated because Federal mandates stipulate that, in order to qualify as renewable, hydroelectric generation must be produced through increased efficiency or the addition of new capacity at an existing hydroelectric project, and there are no existing hydroelectric projects near the Base. Hydrokinetic generation technology was also considered, but no rivers in the vicinity of the Base meet the minimum flow rate requirements for this technology to be effective at this time. Geothermal technology was dismissed because central Georgia lacks suitable geothermal resources.

Municipal solid waste, landfill gas, and wood waste biomass sources were not suitable for implementation at Robins AFB because sufficient fuel sources do not exist in appropriate quantities on or near the Base (**Table 2-1**). Insufficient municipal solid waste, landfill gas, and wood waste biomass are generated on Base to make these renewable energy sources viable for implementation. There are no active landfills on the Base; the use of municipal solid waste and wood waste biomass would require importing these materials onto the Base creating potential security issues. Further, using municipal solid waste and wood waste biomass would generate air pollutants, including GHG. Use

Table 2-1. Renewable Energy Source Evaluation

Evaluation Criteria	Renewable Energy Source			
	Solar	Wood Waste Biomass	Municipal Solid Waste	Landfill Gas
Is The Technology Renewable?	Yes	Yes	Yes	Yes
Are Required Energy Sources Available On Robins AFB?	Yes	No	No	No
Is The Technology Reasonably Compatible With Existing Infrastructure on Robins AFB?	Yes	Yes	Yes	No (requires active landfill)

Does The Technology Generate GHG and air pollutants?	No	Yes	Yes	Yes
How Does The Public View The Technology?	Most favorable	Less favorable	Less favorable	Most favorable
How Much Solid Waste Is Generated By The Technology?	Low volume	Moderate volume	Moderate volume	Low volume (excludes landfill)

of solar energy does not generate GHG, air pollutants, or solid waste and would be more favorably viewed by the public than the other renewable energy sources.

The evaluation concluded that the use of solar energy was the most suitable technology for development on Robins AFB. This technology satisfies the purpose and need for the project and best met the requirements and selection criteria for the project. Further, the availability of this renewable energy source on Robins AFB makes implementation realistic.

2.4.2 Location Alternatives

Other potential site locations for the proposed solar PV array were considered, but it was determined that alternative sites on Base are currently being held for other future uses per the Base General Plan; would not be compatible with the mission or force protection needs; were insufficient in size or accessibility; or were less accessible to transmission interconnection points.

Other technology and location alternatives were not reasonable. Therefore, only the Proposed Action and No-Action Alternatives are evaluated in detail in this EA.

In addition to the Proposed Action, the Robins AFB Energy Office is considering the development of other solar PV facilities on Base and evaluating that action under a separate EA. These facilities would not be developed under an EUL agreement. The

facilities would consist of solar canopies over parking lots and roof-mounted facilities on buildings throughout the Base. Electricity generated by these solar PV facilities would be distributed directly to meet Base energy needs at nearby buildings. The effects of both proposed actions are considered under the cumulative effects analysis in this EA.

2.5 COMPARISON OF POTENTIAL IMPACTS

During construction, the Proposed Action would have no adverse impact on floodplains or wetlands, storm water, groundwater, drinking water supply, wastewater, solid waste, hazardous materials and waste, toxic materials or safety at Robins AFB (**Table 2-2**).

Construction activities would have insignificant adverse impact on topography, surface water, soils, air quality, the noise environment, the biological environment, cultural resources, and transportation (see **Table 2-2**). Construction would have an insignificant beneficial effect on the socioeconomic environment.

During operation, the Proposed Action would have no adverse impact on topography, surface waters, floodplains and wetlands, storm water, soils, groundwater, air quality, wastewater, solid waste, hazardous materials and waste, toxic materials, the noise environment, the biological environment, cultural resources, safety, or transportation (see **Table 2-2**). Operation of the solar PV array would have a minor adverse impact on water supply, and a beneficial effect on the socioeconomic environment (see **Table 2-2**).

Decommissioning of the solar PV facilities would have impacts on the environment similar to those from construction, with two exceptions. There would be insignificant adverse impact on solid waste and hazardous materials and waste (see **Table 2-2**).

Substantial amounts of solid and industrial waste would result from removal of the solar PV facilities. It is expected that the decommissioning would attempt to maximize the recycling of all facility components thereby minimizing the generation of solid waste. Hazardous materials, such as fuel and lubricants, and the solar PV panels, if containing hazardous materials, would be handled in accordance with Robins AFB's *Hazardous*

Table 2-2. Comparison of Alternatives Receiving Detailed Evaluation

		Proposed Action			No-Action
Phase of Action		Construction	Operation	Decommission	N/A
Environmental Component		+ = Beneficial Effect, --- = Insignificant Adverse Effect, X = Adverse Effect, O = No Effect			
Physical Environment	Topography	---	O	---	O
	Surface Waters	---	O	---	O
	Floodplains and Wetlands	O	O	O	O
	Storm Water	O	O	O	O
	Soils ¹	---	O	---	O
	Groundwater ¹	O	O	O	O
	Water Supply and Drinking Water	O	---	O	O
Air Quality		---	O	---	O
Waste Management and Toxic Materials	Wastewater	O	O	O	O
	Solid Waste	O	O	---	O
	Hazardous Materials and Waste	O	O	---	O
	Toxic Materials	O	O	O	O
Noise Environment		---	O	---	O
Biological Environment		---	O	---	O
Cultural Resources		---	O	---	O
Socioeconomic Environment		+	+	+	---
Safety		O	O	O	O
Transportation		---	O	---	O
Cumulative Impacts		---	+	---	O

¹Should soil or groundwater be characterized as special waste or hazardous waste, then these materials would be considered in the appropriate environmental component, i.e., Solid Waste or Hazardous Materials and Waste, respectively.

Waste Management Plan (HWMP) and all applicable local, state, and Federal regulations.

Under the No-Action Alternative, the proposed solar PV array would not be developed on the EUL Parcel. The No-Action Alternative would not benefit the socioeconomic environment (see **Table 2-2**), and Robins AFB would not realize the benefit from leasing the excess land for development of the solar PV array.

3.0 AFFECTED ENVIRONMENT

This section describes the existing environment within the areas potentially affected by the Proposed Action and No-Action Alternative. A brief description of the EUL Parcel is followed by descriptions of the physical environment, air quality, waste management and toxic materials, noise environment, biological environment, cultural resources, socioeconomic environment, transportation, and safety. Descriptions of the project elements and environmental resources provide the basis for analysis of potential effects on the environment from the Proposed Action and No-Action Alternatives. Relevant background on Robins AFB is presented in **Appendix A**. Site-specific information presented in this section is derived from on-site evaluation and information obtained from the 78th Civil Engineer Group (78 CEG) and other Robins AFB personnel.

3.1 PHYSICAL ENVIRONMENT

The following description of the physical environment of the study area is based on its principal components: topography, surface waters, floodplains, wetlands, storm water, soils, groundwater, and water supply and drinking water.

3.1.1 Topography

Robins AFB is located in central Georgia on the upper margin of the Upper Coastal Plain physiographic province. Elevations on Robins AFB range from a high of approximately 107 meters (350 feet) above sea level (ASL) to a low of approximately 72 meters (235 feet) ASL. Relief is generally minimal on most of the installation, and rarely over 10 meters (30 feet) locally.

Proposed Action Site: Local topography varies within the EUL Parcel (**Table 3-1**). Topography at the site slopes from northwest to southeast, and total change in elevation is approximately 5 meters (15 feet). No current activities or operations associated with the EUL Parcel significantly impact topography.

Table 3-1. Local Topography within the EUL Parcel

Highest Elevation¹ (m/ft)	Lowest Elevation¹ (m/ft)	Average Elevation¹ (m/ft)	General Aspect¹
99 / 325	91 / 298	94 / 307	Southeast

Source: United States Geological Survey, 1979

¹All reported values are approximate ASL.

3.1.2 Surface Waters

Most of the landforms on and around Robins AFB have been affected by the Ocmulgee River, which is one of the dominant watercourses in west-central Georgia and is part of the Altamaha River watershed. The Ocmulgee is the sixth largest river in Georgia based on mean annual flow rate.

The upland portion of Robins AFB is drained by four intermittent streams that flow west to east into the Ocmulgee floodplain. Surface water at the EUL site flows to the south into wetlands and into a larger stream, Sandy Run Creek, that forms the southern boundary of the Base and discharges to the Ocmulgee River.

Proposed Action Site: No natural surface water bodies are located on or near the EUL Parcel. Surface water from the parcel eventually drains to wetlands and Sandy Run Creek to the south and then to the Ocmulgee River. No current activities or operations occurring within the EUL Parcel significantly impact surface waters (see **Section 3.1.4**).

3.1.3 Floodplains and Wetlands

The Ocmulgee River floodplain is about 4.8 kilometers (3 miles) wide from bluff to bluff at Robins AFB. The distance from the Base's westernmost bluff of the floodplain to the river averages about 3.2 kilometers (2 miles). Nearly all of the Horse Creek / Ocmulgee River floodplain at Robins AFB falls into Zone A, the area of 100-year floods.

Approximately 911 hectares (2,250 acres [33% of the land area]) of delineated wetlands occur across the Base, and high-quality wetlands are present throughout the undeveloped portions of the Base. Most of the wetlands are broad-leaved deciduous, forested wetlands. More than half of all the wetlands on Base are associated with the Ocmulgee River floodplain. Wetlands in the Ocmulgee floodplain are seasonally and semi-permanently flooded.

Proposed Action Site: Based on review of flood insurance rate maps (FIRMs) of the Federal Emergency Management Agency (FEMA, 2007), the EUL Parcel is not located within a designated flood zone. Based on review of the most recent wetland maps for Robins AFB (Robins AFB, 2007b), and site observations, no wetlands are present within the EUL Parcel, although wetlands do occur immediately south of the parcel. No current activities or operations occurring within the EUL Parcel significantly impact floodplains or wetlands (see **Section 3.1.4**).

3.1.4 Storm Water

Storm water runoff can enter Robins AFB from areas to the west, principally through four storm water inlets, located near Buildings 43, 85, 380, and 640. Storm water flows east from the northern inflow points and eventually flows into the wetlands and Horse Creek east of the installation. The southern inflow points discharge to the main intermittent stream that flows into Duck Lake. Storm water runoff from the northern portion of Base flows north/northeast to the wetlands of the Ocmulgee River floodplain. Storm water from the north-central portion of Base flows along natural, intermittent streams and man-made drainage features into Horse Creek. Storm water from the south-central portion of Base flows into the intermittent streams that feed Duck Lake, then continues to flow east along the unnamed stream through Patton's Pond and into floodplain wetlands. Storm water from the southern portion of Base flows along natural and man-made drainage features into floodplain wetlands. Some of this runoff collects in Scout Lake and Luna Lake while runoff from other areas discharges to Sandy Run Creek by overland flow and from ditches.

Proposed Action Site: The EUL Parcel does not currently receive storm water runoff from off-site sources. The parcel is largely forested and the majority of precipitation falling on this site likely infiltrates into the soil or discharges through sheet flow into roadside ditches along Macon Street; eventually draining to the floodplain wetland associated with Sandy Run Creek.

3.1.5 Soils

The soil survey of Houston County (United States Department of Agriculture [USDA], 1967) mapped the most common upland soils on Base as Lucy sand, Lakeland fine sand, and Orangeburg sandy loam. The bottomland soils on Base were mapped as either Chastain-Leaf or Swamp soils. The soils at Robins AFB were mapped more recently in 1992 (Gulf, 1992). The 1992 soil survey produced more detail for the installation, and included some soil series not mapped in the original USDA survey. Eighteen soil units and nine complexes were mapped. The upland soils are typically sandy and well-drained with low fertility, while the bottomland soils are generally moderately well- to very poorly-drained and subject to flooding. In general, all undeveloped soil types on base, including both bottomland (wetland) and upland soils, are suitable for wildlife food plants and protective cover vegetation.

Potential prime agricultural soils on Base include Bonifay loamy sand, Dothan loamy sand, Fuquay loamy sand, Lynchburg sandy loam, and Orangeburg sandy loam. Chastain, Grady, Kingsland, Osier-Kinston, and Tawcaw soils are considered wetland (hydric) soils and typically are not suitable for construction.

Proposed Action Site: The dominant soil types within the EUL Parcel are Dothan Loamy Sand, Fuquay Loamy Sand, Bonifay Loamy Sand, and Orangeburg Loamy Sand (Robins AFB, 2007b). Soils at the site have been previously disturbed by silvicultural activities and operation of the former ATV training area. Soils are predominantly covered with grass or forest, and, aside from the former ATV training area, the soils are not exposed. Soil contamination is not known to exist on the parcel (Robins AFB,

2013a). The soil stockpiled at the site originates from small construction projects on the Base and are not contaminated with hazardous wastes or petroleum products. Current activities and operations occurring within the parcel do not significantly impact on-site or off-site soils.

3.1.6 Groundwater

Background information concerning the aquifers at Robins AFB is presented in **Section 3.3 of Appendix A**. Much of Robins AFB, including all the EUL Parcel, is situated atop an important area of groundwater recharge as defined by the *Most Significant Groundwater Recharge Areas of Georgia* (Davis et al., 1989).

Proposed Action Site: Estimated groundwater flow at the EUL Parcel is to the southeast toward Sandy Run Creek and ultimately to the Ocmulgee River. Groundwater contamination is not known to exist at the EUL Parcel. Current activities and operations occurring within the parcel do not significantly impact on-site or off-site groundwater.

3.1.7 Water Supply and Drinking Water

Robins AFB operates its own public water supply system under State of Georgia Permit No. CG1530042. The system receives groundwater from seven (six currently active) water supply wells installed between May 1956 and 2004, all of which produce water from the Blufftown aquifer. The capacity of the public supply wells is 39 million liters (10.3 million gallons) per day. However, constant use at this rate is not possible due to permit withdrawal limitations of approximately 19 million liters (5.01 million gallons) per day. The water supply system provides water for irrigation, industrial processes, and drinking water to a workforce of approximately 24,000 civilian and military personnel. In 2010, the average daily water use was 5.67 million liters (1.5 million gallons) with a peak usage of 7.19 million liters (1.9 million gallons) per day.

Proposed Action Sites: No groundwater drinking wells are located within the

boundaries of the EUL Parcel. However, inactive groundwater drinking well No. 19 is located adjacent to the parcel, and existing potable water distribution pipes are located along Macon Street. The well was taken out of service because naturally-occurring geologic deposits resulted in several radionuclides exceeding maximum contaminant levels for drinking water. Current activities and operations occurring within the EUL Parcel do not significantly impact on-site or off-site water supply or drinking water.

3.2 AIR QUALITY

3.2.1 Regional Air Quality

The State of Georgia is classified as in attainment for all of the National Ambient Air Quality Standards (NAAQS) criteria pollutants except for 1997 8-hour ozone (O_3) and 1997 particulate matter (PM) 2.5. Air quality in Houston County, which includes Robins AFB and the Proposed Action Site, is classified as an attainment area (i.e., pollutant levels are below the NAAQS for all criteria pollutants). The nearby Macon Nonattainment Area, which includes Bibb County and a portion of Monroe County, was redesignated as a maintenance area for 8-hour O_3 in June 2007 (Federal Register, 2007), and, in March 2011, the United States Environmental Protection Agency (USEPA) proposed that the Macon Area has attained the 1997 annual PM 2.5 standard. No portion of the Proposed Action extends into Bibb County to the north of Houston County. Air monitoring stations closest to Robins AFB are located in Warner Robins (PM 2.5) and Macon (O_3 , PM 2.5, PM 10, and sulfur dioxide [SO_x]).

3.2.2 Air Emission Sources

Robins AFB is compliant with its Title V air permit (Permit #9711-153-0033-V-02-0, #9711-153-0033-V-02-2, #9711-153-0033-V-02-4, and #9711-153-0033-V-02-5).

Proposed Action Site: Significant air emissions are not currently being generated at the EUL Parcel. Mobile source air emissions are generated by equipment used to stockpile soil on the parcel and by personally-owned vehicles (POVs) using the roadways in the

area. Current activities and operations occurring within the EUL Parcel do not produce, or significantly impact, air emissions.

3.2.3 Greenhouse Gas

GHGs are gases that trap heat in the atmosphere and are generated by both natural processes and human activities. GHGs include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), O₃, fluorinated gases (FGs), and halocarbons (HCs). Combustion of fossil fuels and biomass can release CO₂, CH₄, and N₂O, the three major GHGs. Chemical reactions among O₃ precursors in the atmosphere produce O₃; these precursors come in part from fuel combustion. FGs are emitted from a variety of industrial processes. Common sources of HCs include refrigerants, propellants, and industrial solvents.

By statutes, EOs, and agency policies, the Federal Government is committed to the goals of energy conservation, reducing energy use, eliminating or reducing GHG emissions, and promoting the deployment of renewable energy technologies that are cleaner and more efficient. When a proposed Federal action involves these goals, information on GHG emissions that is useful and relevant to the decision should be used for deciding among alternatives (CEQ, 2010). The reference point of 25,000 metric tons (27,750 tons) of direct CO₂-equivalent (CO₂-e) GHG emissions provides a minimum level that would require consideration in NEPA documents.

Proposed Action Site: Current activities and operations occurring within the EUL Parcel do not produce significant GHG emissions.

3.3 WASTE MANAGEMENT AND TOXIC MATERIALS

An environmental baseline survey (EBS) for the proposed EUL Parcel has been conducted and found no areas of environmental concern associated with the EUL Parcel (Robins AFB, 2013b).

3.3.1 Wastewater

Sanitary sewage generated on the installation is treated at Robins AFB's Sanitary Wastewater Treatment Plant (SWTP), and effluent is monitored for biological oxygen demand, chemical oxygen demand, coliform bacteria, pH, oil and grease, ammonia, metals, suspended solids, and chlorine. Discharges currently are within National Pollutant Discharge Elimination System (NPDES) permit limits.

Industrial wastewater generated on Base is processed through one of two Industrial Wastewater Treatment Plants (IWTPs). IWTP 1 treats all industrial wastewater, with the exception of wastewater from the Plating Shop, which is processed at IWTP 2.

Proposed Action Site: Wastewater is not generated at the EUL Parcel. Sanitary sewer lines are located adjacent to the parcel along Marchbanks Drive and Macon Street. Current activities and operations occurring within the EUL Parcel do not produce, or significantly impact, wastewater.

3.3.2 Solid Waste

Solid wastes (municipal and industrial) are generated from all areas of Robins AFB, including housing, municipal operations, office complexes, industrial facilities, and construction/demolition areas. An *Integrated Solid Waste Management Plan* (ISWMP) has been developed to establish an integrated approach to dealing with solid waste management issues at Robins AFB (Robins AFB, 2010a). The approach includes source reduction, recycling, and disposal. Solid waste must be disposed of in accordance with Section 01560 Environmental Requirements, Section 01572 Construction & Demolition Waste Management of the Robins AFB Civil Engineering Specifications, and the Robins AFB ISWMP. Reuse, recycling, and composting are strongly encouraged. Solid wastes destined for recycling are collected at various locations on Base in waste specific containers, or are turned in to the Qualified Recycling Program Scrap Metal Recycling

Center or the Defense Logistics Agency Disposition Services (DLADS [formerly known as the Defense Reutilization and Marketing Office]).

Solid wastes that cannot be recycled are collected and transported to the Houston County landfill for disposal. Houston County has committed to providing solid waste disposal services to Robins AFB and has a permitted municipal solid waste (MSW) landfill and a construction and demolition landfill with adequate capacity. Additional capacity could be acquired through expansion of the landfill when needed.

Currently, 79 Solid Waste Management Units (SWMUs) have been identified on the Base. By definition, a SWMU is:

“Any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for management of solid or hazardous waste. Such units include any area at a facility at which solid wastes have been routinely and systematically released” (Proposed Rule for Corrective Actions at SWMUs, 55 FR 30801, July 27, 1990).”

The terms “solid waste” and “hazardous waste” (a subset of solid waste) are explicitly defined for purposes of the above definition in 40 CFR 261.

All potentially hazardous or contaminated waste must be sampled to ensure it is properly characterized and results are reviewed by the Environmental Management Branch (78 CEG/CEIEC). Wastes contaminated with lead-based paint (LBP), asbestos containing materials (ACM), or other hazardous materials at levels below their respective regulatory thresholds require the submission of a Special Waste Acceptance Application with analytical data to 78 CEG/CEIEC in order to obtain preapproval for disposal at Houston County Landfill prior to start of work.

Proposed Action Site: No SWMUs are located near the EUL Parcel. The EBS did not detect any environmental concerns related to solid waste (Robins AFB, 2013a). Current activities and operations occurring within the EUL Parcel do not produce, or significantly

impact, solid waste.

3.3.3 Hazardous Materials and Waste

Hazardous materials are stored and handled in accordance with Occupational Safety and Health Administration (OSHA) regulations, 29 CFR 1910.1200(e) through (h), *Hazard Communication*. Hazardous waste is managed and disposed of under the Resource Conservation and Recovery Act (RCRA) *Standards Applicable to Generators of Hazardous Waste* (40 CFR Part 262), Georgia Rule 391-3-11, *Hazardous Waste Management*, Robins AFB's HWMP (2013b), and Robins AFB's Hazardous Waste Facility Permit [Hazard Waste Facility Permit HW-064(S)]. Universal waste is stored and handled in accordance with the *Standards for Universal Waste Management* (40 CFR Part 273).

Proposed Action Site: No hazardous materials are stored and no hazardous waste is currently generated at the EUL Parcel. Hazardous wastes or petroleum wastes were not observed on or adjacent to the parcel during the EBS (Robins AFB, 2013a).

3.3.4 Toxic Materials

A Base-wide survey for friable ACMs was completed in March 1988. Known friable Regulated ACM (RACM) was removed, and friable and non-friable ACM continue to be removed from Base facilities through renovation and construction activities. Water and sewer mains on Robins AFB, as well as components of the storm water drainage system (SWDS), may be constructed of asbestos-cement pipe. ACM and LBP surveying and sampling are included in renovation and construction project activities. All identified and potential ACM and LBP would be addressed and managed in accordance with applicable local, state, and Federal regulations.

In July 1991 Robins AFB completed inspection and removal of all transformers and other large capacitors containing polychlorinated biphenyls (PCBs) at concentrations greater

than 50 parts per million, thereby achieving “PCB-free” status. Robins AFB’s PCB management programs now focus on proper disposal of smaller capacitors, including fluorescent light ballasts that are not regulated under the Toxic Substances Control Act, but pose a risk of liability under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) if they are disposed of as MSW and contaminate municipal landfills.

Proposed Action Sites: No toxic materials are stored or used at the EUL Parcel. Current activities and operations occurring within the parcel do not produce, or significantly impact, toxic materials per the EBS.

3.4 NOISE ENVIRONMENT

Robins AFB completed noise modeling in 1997 as part of an Air Installation Compatible Use Zone (AICUZ) study (Middle Georgia Regional Development Center, 2004). The noise modeling contours were based on the Day-Night Average Noise Level (DNL), in units of decibels (dBs). The annual average DNL is a descriptor used by the USAF to assess exposure to aircraft noise, predict community response to various noise levels and identify compatible land uses. The AICUZ is primarily concerned with identifying areas with elevated noise levels (greater than or equal to 65 dBs) in order to promote compatible land uses. On-base personnel expect elevated noise levels due to the nature of air base activities and are protected in accordance with DoD and OSHA health and safety requirements, where applicable.

Proposed Action Site: Current activities and operations within the EUL Parcel do not generate significant noise levels. Minor levels of noise are generated by heavy equipment at the soil stockpiling area or POVs accessing the archery range and nearby facilities. Off-site noise is generated by vehicles on the adjacent roadways and aircraft on the airfield and taxiways. Noise sources such as construction activities, heavy equipment, and vehicle traffic are minor in comparison to the aircraft noise generated by airfield operations and maintenance-related engine runs. Based on the most recent noise

contour data (Middle Georgia Regional Development Center, 2004), noise levels at the EUL Parcel are less than 65 dB, well below the Air Force Occupational Safety and Health (AFOSH)-established exposure limit of 85 dB (by 8-hour time weighted average) that requires use of personal protective equipment (PPE) to protect hearing.

3.5 BIOLOGICAL ENVIRONMENT

The biological environment and ecology of Robins AFB is highly diverse, containing several distinctive vegetation communities as well as numerous wildlife habitats and species (Robins AFB, 2007a). Two ecologists contracted by 78 CEG/CEIER surveyed the EUL Parcel on May 9, 2013 and the parcel was evaluated for general habitat conditions and the presence of flora and fauna.

3.5.1 Flora

Proposed Action Site: Approximately 1 hectare (3 acres) in the central portion of the EUL Parcel has been previously disturbed by the former ATV training. The area consists of constructed dunes and hills, stockpiled soil, and weedy-herbaceous vegetation. Many invasive plant species are present in this area. The remainder of the parcel, approximately 19 hectares (47 acres), consists of loblolly pine plots and upland forest. No current activities or operations within the EUL Parcel significantly impact flora.

3.5.2 Fauna

Proposed Action Site: Much of the central portion of the EUL Parcel has been previously disturbed by the former ATV training area, which consists of constructed dunes and hills, and contains weedy-herbaceous vegetation. Excess soil from other Base construction projects is now stockpiled on a portion of this area. The former ATV training area may provide limited habitat and foraging opportunities for wildlife. The remainder of the site consists of upland forest and loblolly pine plots, which provide suitable wildlife habitat.

Bird species characteristic of the pine and pine/mixed hardwood habitats on Robins AFB are described in Appendix A (Section 5.2.1) and supplemented herein with more recent survey information (**Table 3-2**)

Table 3-2. Bird Species of Pine and Pine/Mixed Hardwood Habitats

American crow	<i>Corvus brachyrhynchos</i>
Blue Jay	<i>Cyanocitta cristata</i>
Carolina chickadee	<i>Poecile carolinensis</i>
Carolina wren	<i>Thryothorus ludovicianus</i>
Common grackle	<i>Quiscalus quiscula</i>
Common mallard	<i>Anas platyrhynchos</i>
Eastern bluebird	<i>Sialia sialis</i>
Eastern towhee	<i>Pipilo erythrophthalmus</i>
Eastern wood pewee	<i>Contopus virens</i>
Gray catbird	<i>Dumetella carolinensis</i>
Great crested flycatcher	<i>Myiarchus crinitus</i>
Mourning dove	<i>Zenaida macroura</i>
Northern cardinal	<i>Cardinalis cardinalis</i>
Northern mockingbird	<i>Mimus polyglottos</i>
Prothonotary warbler	<i>Protonotaria citrea</i>
Red-bellied woodpecker	<i>Melanerpes carolinus</i>
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>
Red-winged blackbird	<i>Agelaius phoeniceus</i>
Tufted titmouse	<i>Baeolophus bicolor</i>
Wood duck	<i>Aix sponsa</i>
Wood thrush	<i>Hylocichla mustelina</i>
Yellow-rumped warbler	<i>Dendroica coronata</i>

Source: Robins AFB, 2008c.

No current activities or operations within the EUL Parcel significantly impact fauna.

3.5.3 Endangered, Threatened and Sensitive Species

Based on review of United States Fish & Wildlife Service (USFWS) databases of known species occurrences, results of routine threatened and endangered species surveys conducted on Base (Heyman, 1994; Robins AFB, 1999, 2000, 2008b and 2010b), the Base's Integrated Natural Resources Management Plan (INRMP) and component plans (Robins AFB, 2001, 2007b, and 2012), there are no Federally-listed threatened or endangered plant or animal species on Robins AFB, except for the American alligator (*Alligator mississippiensis*), which is listed because of similarity of appearance to the Federally endangered American crocodile (*Crocodylus acutus*).

Proposed Action Site: No threatened, endangered, or sensitive plant or animal species or their habitats are located within, or adjacent to, the EUL Parcel. A state species of concern, Harper's bog heartleaf (*Hexastylis shuttleworthii* var. *harperi*), does occur in the wetlands south of the parcel, but are not present on the subject site. Current activities and operations within the EUL Parcel do not significantly impact endangered, threatened, or sensitive species.

3.6 CULTURAL RESOURCES

The archaeological and cultural resources of Robins AFB are summarized in the Integrated Cultural Resources Management Plan (ICRMP) (Robins AFB, 2011b, effective 8 November 2011). The upland portions of the installation have been completely surveyed for archaeological sites and historic structures/districts, and the survey work has been reviewed and accepted by the Georgia Department of Natural Resources Historic Preservation Division / State Historic Preservation Office (SHPO). In 2003, an archaeological evaluation and soil survey mapped areas on Base with intact soil profiles for future archaeological investigations. This report showed that the soil over the

entire airfield and many adjacent areas was significantly disturbed by construction activities that took place between the mid-1940s and early 1960s (Robins AFB, 2003).

Section 4.5 of the Robins AFB's Comprehensive Programmatic Agreement (PA) between Robins AFB, the SHPO, and the Advisory Council On Historic Preservation (ACHP) Regarding all National Register of Historic Places (NRHP)-Eligible Cultural Resources on Robins AFB (8 Aug 08; Robins AFB, 2008a, as amended in 2013) states:

"If construction or other land clearing activities are planned for sites that have been surveyed by an archaeologist and determined not to contain NRHP-eligible archaeological sites, and a report of said survey has been previously provided to the SHPO for review and concurrence, then such activities will not require coordination with the SHPO or the ACHP."

Proposed Action Site: In compliance with Section 106, all known archeological and historic sites within and adjacent to the EUL Parcel were identified (**Table 3-3**). There are no historic structures present on or adjacent to the parcel. Three archaeological sites are known. Site 9Ht32, the site of two former tenant houses (late 19th-20th century), is within the parcel, while Sites 9Ht30 (eligible prehistoric Woodland site) and 9Ht169 (ineligible undetermined prehistoric and historic [20th century]) are located south of the parcel. No current activities or operations within the EUL Parcel significantly impact cultural resources.

Table 3-3. Archaeological Sites Located Within or Adjacent to the EUL Parcel

Site No.	Name	NRHP Status	Direct Impact
9Ht32	Two Tenant Houses	Ineligible	Yes
9Ht169	Perimeter Road Gully Site	Ineligible	No
9Ht30	Lamoreaux Peat Bog Site	Eligible	No

NRHP = National Register of Historic Places

3.7 SOCIOECONOMIC ENVIRONMENT

Socioeconomic resources include the basic attributes and resources associated with the human environment. In particular, this includes population and economic activity. Economic activity typically encompasses employment, personal income, and industrial growth. Additionally, The USAF's *Interim Guide for Environmental Justice with the Environmental Impact Analysis Process* and EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, require consideration of environmental justice issues, and these concerns are addressed as part of the socioeconomic environment.

Based on review of United States Census Bureau data (United States Census Bureau, 2013), the majority of the area adjacent to Robins AFB has a minority population greater than 45%, and greater than 16% of the population is below poverty level. Houston County has a minority population of approximately 35% and approximately 12% of Houston County is below poverty level. According to the *Economic Impact Statement 2010* (Robins Rev-Up, 2013), Robins AFB had a total economic impact on middle Georgia of approximately \$2.9 billion in FY 2013. This value differs from the previously reported value of \$4 billion because of a change in methodology to that in more common use at other Air Force installations.

Proposed Action Site: The EUL Parcel currently does not support or generate significant economic activity. No on-site operations generate significant income and no workers are employed specifically to work at this location. Current activities and operations occurring within the EUL Parcel do not generate or adversely affect economic activity.

3.8 TRANSPORTATION AND SAFETY

At Robins AFB, safety issues are those that directly affect the protection of human life and property, and principally involve aviation, munitions, and fire prevention. In

addition, USAF personnel are protected by OSHA and AFOSH standards, Robins AFB safety requirements, and RCRA (see **Section 3.3.3**). The primary safety in this EA is flight safety.

The Federal Aviation Administration considers solar PV to be the technology that provides the best opportunity for development on airport properties (FAA, 2010). Solar PV is more compatible with development on air installations than other solar technologies because it is more cost effective for serving small-scale, onsite electricity demand; has a low profile and modular design which is compatible with airfield operations; is designed to absorb sunlight, thereby minimizing potential adverse effects from glint and glare; and doesn't attract wildlife, a critical aviation and airfield safety hazard.

Proposed Action Site: Roadways around the EUL Parcel include Marchbanks Drive to the north, Macon Street to the east, and State Route 247 to the west. Current trips to the site are presumably minimal. Personnel proceeding to this area converge onto Marchbanks Drive via Warner Robins Street or Macon Street, or access the site directly from Macon Street. Currently, no adverse transportation or safety issues are associated with the EUL Parcel or the immediately surrounding roads.

The EUL Parcel is located in the southwestern portion of the Base, while the runway is located in the northern portion of the Base (see **Figure 2**). The EUL Parcel is approximately 5,300 meters (15,900 feet) from the southern end of the runway.

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4.0 ENVIRONMENTAL EFFECTS

This chapter describes the potential environmental effects of implementing the Proposed Action to construction, operate, and decommission the proposed EUL solar PV array and the No-Action Alternative. Potential effects of construction and operation are based on the description of the actions as presented in **Section 2.5** and existing environmental conditions at the EUL Parcel as presented in **Section 3**. Environmental effects from the No-Action Alternative address effects as they currently occur or would occur in the future without implementation of the Proposed Action.

The solar PV array will either be decommissioned by the developer at the end of the lease term, or the facility could be re-commissioned or re-powered (installation of a new system). Since solar panels have a manufacturer's expected life of 20-25 years, the industry does not have much experience with decommissioning (DOE, 2010). Potential impacts from decommissioning the solar PV array generally would be similar to environmental effects expected from construction of the facility. Decommissioning would have no effect on floodplains, wetlands, storm water, groundwater, water supply, wastewater, toxic materials or safety. Decommissioning effects during facility removal would result in insignificant adverse impacts on air quality, noise, biological environment, cultural resources, and transportation, similar to effects from construction activities. The potential environmental effects from decommissioning that differ somewhat from potential construction or operational effects are discussed further in topography, surface waters, soils, solid waste, and hazardous materials and waste sections below under the heading, "Decommissioning".

4.1 PHYSICAL ENVIRONMENT

4.1.1 Topography

4.1.1.1 *No-Action Alternative*

Under the No-Action Alternative, the topography of Robins AFB would remain unchanged because the solar PV array would not be developed. Implementation of the No-Action Alternative would result in neither significant positive nor significant adverse effects on the topography at or near Robins AFB.

4.1.1.2 *Proposed Action*

Construction: The EUL Parcel has low relief, although some grading to level construction areas would be necessary for installation of the solar PV array. It is anticipated that the solar panels would be placed on steel beams above the ground surface. The steel beams would be supported by poles anchored in the ground. Therefore, no significant positive or significant adverse impacts on topography would result from construction of the Proposed Action.

Operation: There would be no significant positive or significant adverse impacts to topography from the operation of the solar PV facilities, because no actions affecting site topography would occur.

Decommissioning: There would be no significant positive or significant adverse impacts to topography from removal of on-site roads, parking areas, buildings and other structures. Further, terrain modifications and ground disturbance would be kept to the minimum extent practicable for restoring preconstruction water drainage patterns. Beneficial effects could result from re-contouring and revegetation of disturbed areas.

4.1.2 Surface Waters

4.1.2.1 No-Action Alternative

Implementation of the No-Action Alternative would result in neither significant positive nor significant adverse effects on surface waters at or near Robins AFB because the solar PV array would not be developed. Surface waters would remain unchanged and would continue to receive the same storm water discharge. Surface waters are not currently being impacted by activities or operations within the EUL Parcel.

4.1.2.2 Proposed Action

Construction: Construction of the solar PV array would result in insignificant adverse impacts to surface waters on Robins AFB associated with ground disturbance for the placement of support poles for the steel beams to support the solar panels. Robins AFB uses Best Management Practices (BMPs) during day-to-day operations to reduce the potential for leaks of liquids from on-site vehicles to adversely affect surface water. These BMPs address the control and cleanup of inadvertent releases of potential contaminants before the release could adversely affect surface water.

The construction activities would be minimized to the maximum extent practicable and would comply with appropriate local, state, and Federal regulations and permits, as well as an approved Erosion, Sediment and Pollution Control Plan. Therefore, construction of the solar PV array would result in insignificant adverse impacts on surface waters on Robins AFB. See **Section 4.1.4.2** for further discussion of regulatory requirements and appropriate BMPs for controlling soil erosion and storm water runoff and protecting the integrity of surface waters during construction activities.

Operation: There would be no significant positive or significant adverse impacts to surface waters from the operation of the solar PV facilities, because no actions affecting surface waters would occur. The solar panels are impervious surfaces, but it is

anticipated that runoff from the panels would infiltrate and that there would be no net increase in storm water runoff to surface waters. Surface waters would continue to receive storm water discharge in accordance with applicable permits and local, state, and federal regulations for storm water runoff management and discharge. As discussed in **Section 4.1.4.2**, the Proposed Action would not increase the total quantity of storm water.

Robins AFB uses BMPs during day-to-day operations to reduce the potential for leaks of liquids from on-site vehicles to adversely affect surface water. These BMPs address the control and cleanup of inadvertent releases of potential contaminants before the release could adversely affect surface water.

Decommissioning: Removal of the solar PV facilities would result in insignificant adverse impacts to surface waters on Robins AFB associated with ground disturbance during demolition and re-grading activities. However, beneficial effects could result from re-contouring and revegetation of disturbed areas.

4.1.3 Floodplains and Wetlands

4.1.3.1 No-Action Alternative

Implementation of the No-Action Alternative would cause neither significant positive nor significant adverse effects to floodplain characteristics or wetlands on or near Robins AFB because the solar PV array would not be developed, and there are no floodplains or wetlands on the EUL Parcel. These features would remain unchanged and would continue to receive the same storm water discharge from the site and are not currently being significantly impacted by activities or operations within the EUL Parcel.

4.1.3.2 Proposed Action

Construction: As described in **Section 3.1.3**, construction activities would not occur in designated flood zones. The Proposed Action would not result in the modification of

floodplains or wetlands, nor support floodplain development. Ground disturbance and construction would not occur within a 12.2-meter (40-foot) buffer zone around the wetland south of the EUL Parcel. Site development would comply with all local, state, and Federal permits and regulations for construction. Therefore, construction of the solar PV array would have no direct impact on floodplains or wetlands on or near the Base.

Operation: Operation of the solar PV array would result in neither significant positive nor significant adverse effects on floodplains or wetlands. As discussed in **Section 4.1.4.2**, the Proposed Action is not expected to increase the total quantity of storm water runoff. Floodplain and wetland areas would continue to receive storm water discharge which would adhere to appropriate permits and local, state, and Federal regulations for storm water runoff management.

4.1.4 Storm Water

4.1.4.1 No-Action Alternative

Implementation of the No-Action Alternative would cause neither significant positive nor significant adverse effects on or near Robins AFB because the solar PV array would not be developed. Storm water characteristics would remain unchanged and are not currently being significantly impacted by activities or operations within the EUL Parcel.

4.1.4.2 Proposed Action

Construction: Construction of the solar PV array would cause neither significant positive nor significant adverse effects to storm water on or near Robins AFB. All construction activities would comply with appropriate local, state, and Federal regulations and permits, as well as an approved Erosion, Sediment and Pollution Control Plan. As necessary, the construction site operator would use BMPs (e.g., schedules, stabilization measures, structural practices, sediment basins) designed, installed, and maintained in accordance with State of Georgia requirements to control erosion and

transportation of sediment from storm water runoff. The construction site operator (or other certified personnel) would inspect BMPs for effective operation, and BMPs would be replaced or upgraded, as necessary, to address changing site conditions. The construction site would be subject to inspection by government personnel to confirm compliance with the approved Erosion, Sediment and Pollution Control Plan. The construction phase would also include the installation of post-development storm water management and/or erosion control measures to prevent potential storm water discharges and associated soil erosion from occurring after final stabilization of the construction site(s).

In addition to meeting applicable codes for construction, the site operator would be required to satisfy all relevant environmental requirements, submittals, and permits related to the proposed project. The permit process includes submission of Notice of Intent for permit coverage under Georgia's NPDES General Permit No. GAR100003 to discharge storm water-associated with common plans of development; development and approval of an Erosion, Sediment and Pollution Control (ESPC) Plan that meets the requirements of the permit, while written in accordance with Georgia Soil and Water Conservation Commission's *Manual for Sediment and Erosion Control in Georgia*, (5th Edition and updates) and the *Stormwater Local Design Manual for Houston County*; following of the applicable county water protection ordinance; obtaining a Houston County Sediment and Erosion Control Permit; submittal of land disturbance fees to the Georgia Environmental Protection Division (GAEPD) and Houston County; obtaining a dig permit from 78 CEG to protect underground utilities; review of the Base's day-to-day BMP operations and plans; and submission of a Notice of Termination to GAEPD following completion of work when site conditions meet the definition of "final stabilization." If more than 20 hectares (50 acres) of land are disturbed, the ESPC Plan would also require approval from GAEPD. Permit requirements also include performing routine site inspections, sampling storm water discharges from the construction site, and analyzing turbidity of storm water runoff, performed in accordance with 40 CFR Part 136. All permit applications would be submitted to the 78 CEG/CEIEC for review prior to final submittal to governing authorities.

Operation: Although the solar panels are impervious surfaces, it is anticipated that operation of the solar PV facilities would have no significant effect on the total quantity or quality of storm water generated on Robins AFB. As previously discussed, storm water runoff from the solar PV array is expected to infiltrate into site soils. Post-development storm water management measures should be implemented as necessary to control potential storm water discharges occurring after final stabilization of the construction site.

As discussed in Section 4.1.2.2, Robins AFB would continue to use appropriate BMPs to protect water quality from potential leaks or inadvertent releases of potential contaminants. Periodic inspections of the solar panels to monitor for increased erosion due to storm water runoff from the panels (as recommended by NREL, 2011) would be conducted by the developer in accordance with accepted industry practices. In the event of increased erosion, appropriate measures, such as adding gravel to major drip points from the panels or re-grading the soil in critical areas, would need to be implemented to minimize increased soil erosion to surface waters.

4.1.5 Soils

4.1.5.1 No-Action Alternative

Implementation of the No-Action Alternative would cause neither significant positive nor significant adverse effects to soils on or near Robins AFB because the solar PV array would not be developed. Soils would remain unchanged, and soils are not currently being significantly impacted by activities or operations within the EUL Parcel. There are no SWMUs associated with the EUL Parcel, and contamination associated with SWMUs on the installation is currently being monitored and/or remediated as required by law, and this would continue under the No-Action Alternative.

4.1.5.2 *Proposed Action*

Construction: Construction of the solar PV array would not cause significant positive or significant adverse impacts to soils. Soils would be excavated as necessary during construction and used to back-fill excavated areas as needed. Should excavated soils be deemed unsuitable for use as fill-material, then clean fill material would be obtained and used as necessary. As discussed previously in **Section 4.1.4.2**, potential erosion of soils through storm water runoff would be controlled by the use of appropriate pollution prevention measures and adherence to the site's Erosion, Sediment, and Pollution Control Plan and NPDES permit requirements.

Operation: There would be no significant positive or significant adverse impacts on soils from the operation of the solar PV array, because no actions affecting soils would occur. However, storm water runoff from the solar panels should be managed to prevent soil erosion (NREL, 2011). As part of the operations and maintenance (O&M) contract, the PV facilities should be monitored within the initial months following construction to determine if storm water runoff from the solar panels is causing soil erosion. If there is evidence of soil erosion, corrective actions such as adding gravel or other stabilizing materials to major drip points should be implemented. With reasonable monitoring and timely implementation of any needed corrective actions, potential impact on soils would be insignificant.

Decommissioning: There would be no significant positive or significant adverse impacts to soils from removal of on-site roads, parking areas, buildings and other structures. Soils were already disturbed during construction. Beneficial effects could result from revegetation of disturbed areas to minimize the potential for soil erosion.

4.1.6 Groundwater

4.1.6.1 No-Action Alternative

Implementation of the No-Action Alternative would cause neither significant positive nor significant adverse effects to groundwater resources on or near Robins AFB because the solar PV array would not be developed. Groundwater resources would remain unchanged, and groundwater resources are not currently being significantly impacted by activities or operations within the EUL Parcel. Existing groundwater contamination on the installation is currently being monitored and/or remediated as required by law and this would continue under the No-Action Alternative.

4.1.6.2 Proposed Action

Construction: The EUL Parcel and much of Robins AFB are situated atop a groundwater recharge area. Known areas of groundwater contamination are not present on or adjacent to the EUL Parcel. Construction of the solar PV facilities would not encounter groundwater.

Operation: There would be no significant positive or significant adverse impacts to groundwater from the operation of the solar PV facilities, because no actions affecting groundwater would occur. Storm water would continue to be discharged to adjacent floodplain and associated wetland areas. It is expected that most of this water would infiltrate soils and recharge local groundwater aquifers. The quality of storm water discharged would not change, and any effect is expected to be *de minimis* because of the expected minor increase in the total volume of discharged storm water (see **Section 4.1.4.2**).

4.1.7 Water Supply and Drinking Water

4.1.7.1 No-Action Alternative

Implementation of the No-Action Alternative would cause neither significant positive nor significant adverse effects to water supply and drinking water resources on or near Robins AFB because the solar PV array would not be developed. Water supply and drinking water resources would remain unchanged, and these resources are not currently being significantly impacted by activities or operations within the EUL Parcel.

4.1.7.2 Proposed Action

Construction: Limited amounts of water would be used for construction activities. The amount required would be insignificant when compared to the available potable water supply and current usage at Robins AFB.

Operation: There would be no significant positive or significant adverse impacts to water supply and drinking water resources from the operation of the solar PV array. As part of O&M the solar panels would need to be washed periodically. The water demand for a 10 MW PV facility is estimated to be approximately 617 cubic meters per year (0.5 acre-feet per year; DOE, 2010). The amount of potable water necessary for washing the solar panels would be insignificant when compared to the available potable water supply and current usage at Robins AFB.

4.2 AIR QUALITY

Potential air emissions resulting from the Proposed Action and No-Action Alternative have been evaluated based on the Clean Air Act as amended. The effects of an action are considered significant if they increase ambient air pollutant concentrations above NAAQS, contribute to an existing violation of NAAQS, or interfere with or delay the

attainment of NAAQS. Houston County is currently classified as an attainment area, and, as such, the Proposed Action is not subject to the General Conformity Rule.

4.2.1 No-Action Alternative

Implementation of the No-Action Alternative would cause neither significant positive nor significant adverse effects to air quality on or near Robins AFB because solar PV array would not be developed. Air quality would remain unchanged, and air quality is not currently being significantly impacted by activities or operations within the EUL Parcel.

4.2.2 Proposed Action

Construction: Construction of the solar PV facilities would cause temporary, insignificant adverse impacts to air quality. Impacts to air quality would not be significant because construction activities would be limited in scale and scope and appropriate BMPs for control of dust created by vehicle traffic would be used during construction. Should stumps be disposed of by burning rather than disposal at a licensed landfill, the controlled burn would be conducted in accordance with controlled burn rules and air emissions would be temporary and quantities would be *de minimis*.

Implementation of the Proposed Action would temporarily increase emissions of carbon monoxide (CO), FGs, and nitrogen oxides (NO_x) from construction employee traffic and operation of heavy equipment during the construction period. The increase in commutation trips for construction worker vehicles would be temporary, and minor emissions from heavy construction equipment would also be relatively limited in quantity and duration. Therefore, the effect from these emissions would be insignificant.

Operation: There would be no significant positive or significant adverse impacts to air quality from the operation of the solar PV array. Operation of the facilities would not generate air emissions, except for minor emissions from vehicles performing O&M activities.

4.3 WASTE MANAGEMENT AND TOXIC MATERIALS

4.3.1 Wastewater

4.3.1.1 *No-Action Alternative*

Implementation of the No-Action Alternative would cause neither significant positive nor significant adverse effects on wastewater on or near Robins AFB because the solar PV array would not be developed. Wastewater generation and usage would remain unchanged, and wastewater is not currently being significantly impacted by activities or operations within the EUL Parcel.

4.3.1.2 *Proposed Action*

Construction: Construction activities would be scheduled to minimize any disruption of utility service to existing users. If utility service would be interrupted for a short period of time, the interruption could be scheduled to occur over a weekend, if necessary, to further minimize disruption to customers. Additionally, alternate or temporary utility lines would be used, as necessary, to minimize disruption of service.

Operation: There would be no significant positive or significant adverse impacts to wastewater from the operation of the solar PV facilities. Operation of solar PV array would not generate wastewater and no actions affecting wastewater would occur.

4.3.2 Solid Waste

4.3.2.1 *No-Action Alternative*

Implementation of the No-Action Alternative would cause neither significant positive nor significant adverse effects on solid waste on or near Robins AFB because the solar PV array would not be developed. Solid waste generation would remain unchanged, and

solid waste management is not currently being significantly impacted by activities or operations within the EUL Parcel.

4.3.2.2 *Proposed Action*

Construction: Construction of the solar PV array would have insignificant adverse impacts on solid waste generation from site development activities. Solid waste generated during construction activities would be managed in the construction site's laydown area and disposed of in accordance with Section 01560 Environmental Requirements and Section 01572 Construction and Demolition Waste Management of the Robins AFB Civil Engineering Specifications, as well as the Base's ISWMP (Robins AFB, 2010a). Recycling/reuse/composting of materials is strongly encouraged by Robins AFB. Any waste materials, such as asphalt or utility piping, would be separated for reuse and recycling to the extent possible. Waste that is not recyclable would be disposed of by the developer in approved local landfill facilities. The developer would submit monthly Waste Management Reports to the 78 CEG/CEIEC Solid Waste Program Manager and the project contracting officer.

Much of the site is covered with planted loblolly pines and hardwood forest that must be removed. In accordance with AFI 32-7064, *Integrated Natural Resources Management*, the Base environmental function would arrange a logging contract for removal of the forest products that have marketable value. Proceeds from the sale of the timber must be deposited in the DoD Forest Reserve Account. The logging would not remove tree stumps or debris from the site because that is considered a pre-construction requirement. Under Georgia law, the stumps may be disposed by removing to a licensed landfill, recycled, burned under controlled-burn rules, or eliminated using a combination of these methods.

Should they be encountered, Special Wastes, including soils contaminated with LBP, ACM, or other hazardous or toxic materials at levels below their respective regulatory thresholds would require the submission of a Special Waste Acceptance Application with

analytical data provided to 78 CEG/CEIEC in order to obtain preapproval for disposal at Houston County Landfill prior to start of work. Materials or wastes exceeding respective regulatory thresholds would be handled as discussed in **Sections 4.3.3 and 4.3.4**.

Operation: There would be no significant positive or significant adverse impacts on solid waste from the operation of the solar PV array, because no actions affecting solid waste generation or management would occur.

Decommissioning: Although substantial amounts of solid and industrial waste would result from removal of the solar PV facilities, there would be no significant positive or significant adverse impacts on solid waste from decommissioning. Above-ground facilities would be removed; underground facilities would be removed or abandoned in place. It is assumed that the decommissioning would attempt to maximize the recycling of all facility components thereby minimizing the generation of solid waste. Waste materials would be segregated for transportation to a permitted landfill or recycling facility. Recyclable materials would include glass, semiconductor material, steel and aluminum, wiring, inverters, transformers, and solar panels. The O&M building could remain on site if the Air Force determines that it would be useful to leave the structure in place.

4.3.3 Hazardous Materials and Waste

4.3.3.1 No-Action Alternative

Implementation of the No-Action Alternative would cause neither significant positive nor significant adverse effects on hazardous materials and waste on or near Robins AFB because the solar PV array would not be developed. Hazardous materials and waste generation and management would remain unchanged, and these materials are not currently being significantly impacted by activities or operations within the EUL Parcel.

4.3.3.2 *Proposed Action*

Construction: Hazardous materials, such as fuels for construction equipment and vehicles, would be used during construction activities. These materials would be used and handled in accordance with Robins AFB's HWMP and all applicable local, state, and Federal regulations, so significant impacts would not occur due to their use.

There are no known areas of soil contamination within the EUL Parcel. Should contaminated soil or groundwater be encountered and characterized as hazardous, 78 CEG/CEIEC would submit notification, as necessary, to GAEPD pursuant to Robins AFB's Hazardous Waste Facility Permit No. HW-064(S), and such materials would be handled and managed in accordance with applicable local, state, and Federal regulations. Appropriate BMPs would be used (see **Section 4.1.4.2**) to contain contaminants and prevent subsequent contamination of surface waters, wetlands, and floodplains, etc.

Operation: There would be no significant positive or significant adverse impacts on hazardous materials and waste from the operation of the solar PV array, because no actions affecting hazardous materials and waste generation or management would occur.

Decommissioning: Hazardous materials, such as fuels, lubricants, coolants, solvents, and cleaning agents would be handled in accordance with Robins AFB's HWMP and all applicable local, state, and Federal regulations, so significant impacts would not occur due to their use and handling. Most PV technology uses silicon, and other inert, non-hazardous material. However, some solar PV panels can contain heavy metals, such as cadmium telluride. Accidental release to the environment is unlikely since these materials are manufactured into a stable material that is sealed in glass, and care would be exercised during removal and recycling to not damage the PV panels.

Solar panels have a manufacturer's expected life of 20-25 years, so the industry does not have much experience with decommissioning. In order to be deemed 'hazardous' by regulators, decommissioned or defective solar panels must fail to meet the Toxicity

Characteristic Leaching Procedures (TCLP) standards in accordance with the RCRA, or on applicable state policies. Currently, Georgia does not have regulations specifically addressing the handling and disposal of solar panels, while proposed rulemaking in California would treat discarded PV modules as Universal Waste subject to that state's handling and treatment rules, and barring disposal in sanitary landfills (JDSUPRA Law News, 2013). Panels from the solar PV array, if containing heavy metals, and if not recycled, would be disposed appropriately in accordance with all applicable local, state, and Federal regulations for hazardous waste disposal, so significant impacts would not occur due to their use.

4.3.4 Toxic Materials

4.3.4.1 No-Action Alternative

Implementation of the No-Action Alternative would cause neither significant positive nor significant adverse effects on toxic materials on or near Robins AFB because the solar PV array would not be developed. Toxic materials generation and management would remain unchanged, and these materials are not currently being significantly impacted by activities or operations within the EUL Parcel.

4.3.4.2 Proposed Action

Construction: Some existing water and sewerage mains may be constructed of asbestos-cement pipe. Should water or sewerage mains be disturbed as part of construction activities, this would be confirmed prior to disturbance. If encountered, the location of asbestos-cement pipe would be documented and asbestos-cement pipe would be handled and disposed of, if necessary, in accordance with Robins AFB's HWMP, Title V permit, Hazardous Waste Facility Permit, National Emission Standards for Hazardous Air Pollutants (NESHAP; 40 CFR 61 Subpart M), OSHA, and all other applicable local, state, and Federal regulations. The use of ACM, LBP or PCB-containing equipment or materials in new construction at Robins AFB is currently prohibited.

Operation: There would be no significant positive or significant adverse impacts on toxic materials generation or management because no toxic materials would be generated during solar PV array operation.

4.4 NOISE ENVIRONMENT

4.4.1 No-Action Alternative

Implementation of the No-Action Alternative would cause neither significant positive nor significant adverse effects on the noise environment on or near Robins AFB because the solar PV array would not be developed. The noise environment would remain unchanged, and the noise environment is not currently being significantly impacted by activities within the EUL Parcel.

4.4.2 Proposed Action

Construction: Construction of the solar PV array would cause temporary, localized, insignificant adverse impacts to the noise environment associated with typical construction activities. As described in **Section 3.4.2**, the EUL Parcel is not located in an area exposed to noise levels in excess of 85 dBs. Workers in this area would not be required to wear hearing protection compliant with OSHA and USAF Environment, Safety, and Occupational Health (ESOH) requirements. However, if necessary, the developer would be responsible for hearing protection compliant with OSHA for excess noise associated heavy equipment operation or logging activities.

Operation: There would be no significant positive or significant adverse impacts to the noise environment from the operation of the solar PV array, because no actions affecting the noise environment would occur, other than temporary noise from periodic O&M activities.

4.5 BIOLOGICAL ENVIRONMENT

4.5.1 Flora

4.5.1.1 *No-Action Alternative*

Implementation of the No-Action Alternative would cause neither significant positive nor significant adverse effects on plants on or near Robins AFB because the solar PV array would not be developed. The vegetation would remain unchanged, and vegetation is not currently being significantly impacted by activities or operations within the EUL Parcel.

4.5.1.2 *Proposed Action*

Construction: The majority of the EUL Parcel is forested with planted loblolly pines and natural hardwoods that would need to be removed for construction of the solar PV array. The principal effects from the construction and timber operation would be a temporary increase in noise and traffic from equipment and habitat alteration from removing trees within the EUL Parcel. The developer, in coordination with the Base Natural Resources Manager, would determine appropriate measures to minimize or mitigate insignificant impacts from tree removal.

Operation: There would be no significant positive or significant adverse impacts to native or landscape vegetation from the operation of the solar facility, because no actions affecting vegetation would occur after initial installation of the solar PV array.

4.5.2 Fauna

4.5.2.1 *No-Action Alternative*

Implementation of the No-Action Alternative would cause neither significant positive nor significant adverse effects on birds or other wildlife on or near Robins AFB because solar PV array would not be developed. The existing wildlife habitat would remain

unchanged, and wildlife is not currently being significantly impacted by activities or operations within the EUL Parcel.

4.5.2.2 *Proposed Action*

Construction:

The Migratory Bird Treaty Act (MBTA) protects migratory birds. Specific provisions in the statute include establishment of a Federal prohibition, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess,... any migratory bird, included in the terms of the 1916 Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird." (16 USC 703).

Tree removal from the EUL Parcel will alter the existing wildlife habitat; however, the relatively small area affected by tree cutting and removal would not result in adverse effects on birds or other wildlife. Displaced birds and wildlife would relocate to adjacent upland area or the undisturbed bottomland hardwood swamp areas of the extensive Sandy Run Creek floodplain complex south of the EUL Parcel. Natural areas within this extensive floodplain complex would easily accommodate any displaced wildlife. Further, the , in coordination with the Base Natural Resources Manager, would determine appropriate measures to minimize or mitigate impacts. The timber removal would take place outside the nesting/breeding season for resident and migratory birds (March through July).

Operation: There would be no significant positive or significant adverse impacts on wildlife from the operation of the solar PV array, because no actions affecting wildlife would occur as part of solar facility operation.

4.5.3 Endangered, Threatened and Sensitive Species

4.5.3.1 No-Action Alternative

Implementation of the No-Action Alternative would have no adverse impacts on endangered, threatened, or sensitive plant or animal species on or near Robins AFB because the solar PV array would not be developed. These species and their habitats would remain unchanged, and these species are not currently being significantly impacted by activities or operations within the EUL Parcel.

4.5.3.2 Proposed Action

Construction: Endangered, threatened, or sensitive plant or animal species would not be affected by construction of the solar PV array because there are no Federally-listed threatened, endangered or candidate species, nor are there state-listed threatened, endangered, or concern species present within the EUL Parcel.

Operation: There would be no adverse impacts on threatened, endangered, or sensitive plant or animal species from the operation of the solar PV array, because no Federally-listed, state-listed, or other species of Federal or state concern are present on the EUL Parcel and no actions affecting these species would occur during operation of the solar array.

4.6 CULTURAL RESOURCES

4.6.1 No-Action Alternative

Implementation of the No-Action Alternative would cause no adverse effects to cultural resources on or near Robins AFB because the solar PV array would not be developed. Cultural resources would remain unchanged, and these resources are not currently being significantly impacted by activities or operations within the EUL Parcel. Cultural

resources on Robins AFB would continue to be managed and protected as required by Federal and state agencies.

4.6.2 Proposed Action

Construction: Construction of the solar PV array would cause no adverse impacts on cultural resources that are eligible for NHPA protection. There are no historic structures present on or adjacent to the EUL Parcel. One ineligible archeological site (9Ht32, the site of two former tenant houses) is located within the EUL Parcel and would be subject to direct impacts from construction because of excavation and grading. The two archaeological sites south of the EUL Parcel would not be affected by construction.

Per Section 4.5 of the PA between Robins AFB, the SHPO, and the ACHP (Robins AFB, 2008a):

"If construction or other land clearing activities are planned for sites that have been surveyed by an archaeologist and determined not to contain NRHP-eligible archaeological sites, and a report of said survey has been previously provided to the SHPO for review and concurrence, then such activities will not require coordination with the SHPO or the ACHP."

The Proposed Action constitutes an "approved exempt activity" and has not been formally coordinated with the ACHP, but has been formally coordinated with the Georgia SHPO (see **Appendix B**).

Robins AFB completed an archaeological inventory of the entire Base during 2002 in accordance with NHPA Section 110, and the locations of archaeological sites on Base are known. The defined Area of Potential Effect for the Proposed Action does not contain known NRHP-eligible archaeological sites. The Georgia SHPO has concurred on the eligibility classification of every historic resource located within Robins AFB. Further, meetings were held with the culturally-affiliated Native American Tribes at Robins AFB in 2002 to discuss all inventoried archaeological sites. Robins AFB sent a meeting

follow-up letter in 2002 and 2003 requesting tribal comments or concurrence, and, to date, none of the tribes have responded. Accordingly, the culturally-affiliated Native American Tribes are being notified by letter of the nature and location of the Proposed Action (and provided a copy of the Draft EA), and comments are being requested concerning human remains and items such as religious, cultural, or sacred sites, and related matters.

Should newly discovered cultural resource materials of any nature be discovered during the course of construction or other activities related to the Proposed Action, 6 CFR §800.13 and applicable portions of the PA and Robins AFB's ICRMP would be followed. Inadvertent findings of human remains, or discovery of any items, such as religious, cultural, or sacred sites, subject to definition under the Native American Graves Protection and Repatriation Act (NAGPRA), would be promptly and carefully processed and coordinated as applicable under provisions of the National Historic Preservation Act (NHPA), NAGPRA, AFI 32-7065, *Cultural Resources Management*, and other applicable Federal, state, and local laws. Tribal consultation would be sought, and the Base Cultural Resources Manager (CRM) would conduct or oversee monitoring for such findings across the entire project site, as necessary.

Operation: There would be no significant positive or significant adverse impacts to cultural resources from operation of the solar PV array, because no actions affecting cultural resources would occur.

4.7 SOCIOECONOMIC ENVIRONMENT

4.7.1 No-Action Alternative

There would be no potential for significant environmental health risks or safety risks to children, nor disproportionate adverse or positive impact on minority or low-income populations because the solar PV array would not be developed. Therefore,

implementation of the No-Action Alternative would result in neither significant positive nor significant adverse effects on environmental justice.

4.7.2 Proposed Action

Construction: The proposed solar PV array would be located on Robins AFB. Construction of the facilities would provide a short-term economic benefit to the local/regional economy, primarily through new construction expenditures (e.g., demolition/construction labor salaries, equipment, and materials). The construction activities would positively impact the economy through expenditures for goods and services at local businesses by the developer and construction workers.

No significant adverse environmental impacts would occur as a result of constructing the solar PV array, and no populations (minority, low-income, or otherwise) would be disproportionately impacted. The project would be located entirely within the Base property boundary. Appropriate safety procedures would be in place during construction and any potentially hazardous materials or waste would be properly handled and disposed as discussed in previous sections. Therefore, no significant impacts with regard to environmental justice would occur.

The Federal Government will derive economic benefit from the lease of the parcel. As required by law, the Air Force will receive fair market rental value for the leased parcel throughout the duration of the lease agreement.

Operation: No significant adverse economic impacts would occur as a result of operating the solar PV array, and no minority, low-income, or other populations would be disproportionately impacted. Therefore, no significant impacts with regard to environmental justice would occur.

4.8 TRANSPORTATION AND SAFETY

4.8.1 No-Action Alternative

Implementation of the No-Action Alternative would cause neither significant positive nor significant adverse effects on transportation or safety on or near Robins AFB because the solar PV array would not be developed. Local traffic patterns and volume would not be affected.

4.8.2 Proposed Action

Construction: Construction of the solar PV array would cause localized, temporary, insignificant adverse impacts to transportation on Robins AFB. These impacts would be associated with construction activities occurring adjacent to or within roadways and from increased traffic associated with construction workers. To the maximum extent feasible, the construction of the solar PV array would minimize crossings of roadways and existing utility lines. To the extent that small portions of such areas must be crossed, the construction phase of the Proposed Action would include the necessary removal, replacement, and/or repair, as appropriate. Construction activities would be scheduled, and alternate or temporary utility lines would be used as needed, to minimize disruption of utility service to existing users. The impact on transportation and safety would be insignificant because construction activities would be scheduled to minimize disruption of utility service and traffic; appropriate detour routes would be identified and signage placed as necessary; and construction workers would be required to follow appropriate Robins AFB and OSHA safety rules during transit to and from the project site.

In the event that the developer seeks to access the construction site from State Route 247 at Marchbanks Drive that bounds the EUL Parcel to the north, the proposed access would need to be acceptable to the Georgia Department of Transportation (GDOT). If access at this location is acceptable to GDOT and the 78th Air Base (78 ABW) Wing Commander, a security fence would be built around the entire construction area to allow direct access

to the construction site from off-Base. The fence could be attached to the existing installation perimeter fence at both ends of the work site and the developer could control the lock to the gate for free movement on the work site. If direct access to Marchbanks Drive from State Route 247 is not acceptable without further modification of the roadway, then all construction vehicles would enter the Base through the installation's commercial vehicle gate approximately 3 kilometers (2 miles) north of the EUL Parcel, and construction workers would need to obtain security badges. Further, the developer would comply with governing Federal (ex. OSHA), state, Air Force and Robins AFB regulations to ensure worker health and safety during construction. Therefore, there would be no significant positive or significant adverse impacts to safety.

Operation: The Proposed Action would have no significant positive or significant adverse effect on transportation on, or in the vicinity of Robins AFB. If access to the site directly from State Road 247 to Marchbanks Drive is approved, construction vehicles would not enter the secure area of the installation. If access to the EUL Parcel is through existing Base gates, then operators would need to be badged and would travel on surface roads through the installation to the EUL site. Traffic volume during operation of the solar PV array would be insignificant and consist largely of vehicles performing periodic O&M at the facility. Operation of the solar PV array would have no significant impact on vehicular traffic safety because drivers would obey state and installation traffic regulations and there would be a limited number of vehicle trips to and from the facility.

The potential impact of reflectivity from PV modules and other facility components is glint and glare (FAA, 2010). Glare is a potential hazard or distraction for pilots, air-traffic controllers, motorists and residents. These hazards include the potential for permanent eye injury and temporary disability or distractions such as after-image. Solar panels are designed to absorb sunlight and current panels reflect as little as 2% of the incoming sunlight (TRB, 2011), whereas bare soil reflects up to 30% and white concrete can reflect more than 75% of incoming sunlight. Solar panels with an anti-glare coating will further reduce the potential for reflected light. Airplane cockpit and air traffic

control tower windows are coated with anti-reflective glazing and operators wear polarized eye wear to minimize the effect of glare.

MW-sized solar facilities covering multiple acres are operating at a number of airports throughout the US. Interviews with air traffic controllers have revealed no serious complaints from either pilots or air traffic control attributable to glare from existing solar PV facilities (FAA, 2010), and analyses of potential glare effects from solar PV arrays at Buckley and Nellis AFBs concluded that there would be no significant adverse effects on aviation activities (Buckley AFB, 2009; Nellis AFB, 2011).

The potential for adverse effects related to glare from the solar PV array was modeled using the Solar Glare Hazard Analysis Tool (SGHAT) developed by Sandia National Laboratories (**Appendix C**). The runway at Robins AFB is oriented on a northwest to southeast axis. Observation points for the glare analysis were selected at three locations along the southeastern approach-departure clearance surface based on DoD Unified Facilities Criteria (UFC) 3-260-01, *Airport and Heliport Planning and Design*, using Class A Visual Flight Rules (VFR) Runway Imaginary Surfaces. Observation points were selected at the beginning of the clearance surface (0 m / 0 ft elevation), at the mid-point, and at the end (76 m / 250 ft elevation) of the clearance surface for aircraft approaching or departing the runway. The analysis indicated that no glare was predicted at any of the observation points at any time during the year (see **Appendix C**). Based on the model and findings from the literature, reflection from the solar PV array would not adversely impact flight safety, air traffic management, or airspace operations at Robins AFB, and operation of the solar PV array would have no adverse effect on flight safety.

Proper design and siting of solar facilities is probably the most effective means for mitigating potentially hazardous glare, considering size and orientation of the solar PV array (Ho, 2013). Findings from the preliminary reflectivity and glare analysis that indicated the absence of a glare hazard should be confirmed by the developer as part of the solar PV array final design. Once final design parameters are determined, the absence of glare hazard can be confirmed by either on-site testing with a mockup of the solar PV

array or quantitative analysis. Should results of the analysis of the final design configuration indicate the potential for adverse glare hazard, the design would be modified and/or other measures acceptable to Robins AFB would be taken to eliminate the flight safety hazard.

4.9 CUMULATIVE IMPACTS

CEQ regulations stipulate that potential environmental impacts resulting from cumulative impacts should be considered in the EA. A cumulative impact is the impact on the environment which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. In accordance with NEPA, a discussion of cumulative impacts resulting from projects that are proposed, currently under construction, recently completed, or anticipated to be implemented in the near future is presented below.

Three past actions, two future actions, and three proposed actions were identified as potentially producing cumulative environmental effects. No other projects that would have incremental environmental effects were identified.

New General Purpose Warehouse (past): The Defense Logistics Agency constructed a General Purpose Warehouse (GPW) at the northwestern corner of Martin Luther King, Jr. Boulevard and Robins Parkway. The new GPW consists of a 15,568-m² (167,575-ft²), one-story building (used primarily as warehouse space) and a small annex for administrative space. Operations involve receiving and breaking down pallets of commodities and building up and shipping out new pallets of commodities, or receiving and shipping out built-up pallets as a whole. One hundred employees work at the GPW, which operates 24 hours a day, 7 days a week. All truck staging and parking occurs on the site, and existing parking areas on or adjacent to the site are available personnel parking. The construction activities associated with this project increased the area of impermeable land surface by approximately 2 hectares (5 acres). This project has increased the generation of solid waste and sanitary wastewater, the consumption of potable water, and the number of vehicles on local roadways and entering Robins AFB. Depending on workload, the new GPW generates an estimated maximum of 25 trips of new truck, tug and transporter trips on side streets, mainly Watson Boulevard, Warner Robins Street, Robins Parkway, Martin Luther King, Jr. Boulevard, Byron Street and Page Road, between existing warehouse space and

the GPW. Due to the limited number of trips per day and proximity of the majority of existing warehouse space to the GPW, this increase in traffic has not resulted in a significant impact.

Military Family Housing Privatization Initiative, Operations and Management Demolition Effort (past): This O&M demolition effort at the Pine Oak, Forest Park, Crestview and Lakeside residential subdivisions included the demolition of all residential structures. This demolition effort occurred as a part of the larger Military Family Housing privatization initiative. The Proposed Action included removal and proper disposal of construction debris, toxic and non-toxic materials located within the structures, and contaminated soil (if any) encountered during the removal of building foundations, pavement and other subsurface features. In order to adequately and safely perform the demolition activities, minimal removal of trees, shrubs and landscaping occurred; and closure, relocation and/or removal of existing underground utilities within the project area was conducted. The existing roadways were not removed as a part of the Proposed Action and trees, shrubs and landscaping not affected by the demolition activities remained in place. This project temporarily increased the area of permeable land surface (thereby potentially decreasing storm water runoff) and temporarily increased air emissions, noise, traffic volume and volume of solid waste and toxic materials generated by demolition activities.

Advanced Metal Finishing Shop (past): The Advanced Metal Finishing Shop (AMFS) was constructed to replace the existing Plating Shop operations, and is located northwest of the intersection of Robins Parkway and First Street. The project involved the demolition of existing buildings, and the construction and operation of the approximately 9,290-m² (100,000-ft²) AMFS. The existing personnel (25) at the Plating Shop (Building 142) transferred to the AMFS. The AMFS incorporates best available technologies to reduce environmental emissions and industrial waste, while continuing the current mission of providing aircraft overhaul and repair. The project includes the relocation and consolidation of Ground Support Equipment operations to the north ramp area. Construction of the AMFS was determined to have insignificant adverse effects on air quality, solid waste, toxic materials, noise environment, and transportation, while having a beneficial effect on the socioeconomic environment. Operation of the AMFS is expected to have a beneficial effect on water supply and drinking water, air quality, wastewater, the socioeconomic environment, and safety by incorporating best available technologies.

New Security Forces Facility (future): A new Security Forces Facility (SFF) is proposed for construction in the former Pine Oaks residential area. The SFF would consist of an approximately 3,763-m² (40,500-ft²), two-story building and an associated parking/storage area capable of accommodating 400 personnel. Existing Security Forces personnel and operations would relocate to this facility from Buildings 261, 263, and 327. The SFF would include: investigations offices,

pass and registration areas, supply/equipment storage, training areas, armory, law enforcement and security control centers, and corrections and administrative areas. Additional site features would include on-site separate parking areas for Security Forces vehicles and other personal vehicles. The construction activities associated with this project would increase the area of impermeable land surface by approximately 0.8 hectares (2 acres). Traffic would increase in the area of the new facility. However, the approximate 0.5-mile commute between former Security Forces buildings would be eliminated. This project would reduce transportation through congested areas, thus resulting in easier and safer transit.

New Headquarters Air Force Reserve Command Campus (future): A new Air Force Reserve Command (AFRC) Headquarters (HQ) is proposed for construction east of Robins Parkway and west of Duck Lake. The proposed site is bounded by the intersection of Robins Parkway and Cherry Drive to the south and Lakeside Drive to the north. The site is an approximately 14-hectare (35-acre) property comprised of recently demolished residential structures. The new AFRC HQ would consist of multiple buildings, roadways, and parking areas. Existing AFRC operations, currently located in multiple on- and off-Base facilities, would relocate to the AFRC HQ. The facility would employ approximately 1,666 personnel. The existing 1,100 AFRC employees would transfer from other facilities on Robins AFB. Approximately 566 additional employees would be relocated to RAFB from various installations throughout the United States. The construction activities associated with this project would increase the area of impermeable land surface by approximately 6 hectares (15 acres), and would temporarily increase air emissions, noise, traffic volume and the volume of solid waste and toxic materials generated by construction/demolition activities. A long-term increase in traffic would result in the area of the Proposed Action site. However, the commute between existing AFRC facilities would be eliminated. This would provide a more efficient process and eliminate transportation through congested areas, thus resulting in easier and safer transit.

Solar PV Facilities (proposed): New solar PV facilities that are capable of producing up to 10 MW of electricity are proposed for development at multiple locations on Robins AFB. The solar PV facility locations would include 13 solar canopies over parking lots and four roof-mounted facilities that would use thin-film solar panels on Buildings 300, 301, 380, and 385 and generally would be located in the western central and southern portions of the Base. The solar panels would be fixed, and would not rotate to follow the sun's path. The facilities would be designed, constructed, and oriented to minimize or avoid reflections that could impact airfield operations or aircraft on approach. Energy from these solar panels would be tied into local electrical systems in the nearest existing Base facility via underground cables. The solar canopies would provide approximately 50.49 acres for solar panels, while the buildings would provide approximately 47.3 acres for solar panels. The parking lot and roof-top locations represent previously disturbed environment that offers minimal wildlife habitat. Limited

vegetation within or immediately adjacent to the proposed locations would need to be removed and any trees that would shade the solar PV panels would need to be either removed or pruned. The locations of some facilities are within the viewshed of eligible historic buildings, but all are located within the industrial area of the Base and would not significantly change viewshed characteristics. A preliminary glare analysis showed that none of the proposed facilities would present a glare hazard for aircraft/airfield operations. Construction of the solar PV facilities would result in a minor, temporary increase in traffic and noise from construction vehicles and equipment. Operation of the proposed solar PV facilities would not cause significant adverse effects on other environmental resources. There would be a minor beneficial effect on socioeconomics and a positive impact from using renewable energy resources for electricity production and reduction in the use of fossil fuels for operation of Base facilities.

New Command and Control, Intelligence, Surveillance, and Reconnaissance Facility (proposed)

A new Command and Control, Intelligence, Surveillance, and Reconnaissance (C2ISR) Facility is proposed for construction on the southern portion of Robins AFB. Three sites are proposed for development of a 9,290-gross-square-meter (100,000-gross-square-foot) interim facility, and two sites are proposed for development of a 46,538-gross-square-meter (500,930-gross-square-foot) permanent facility. Ultimately it is presumed that a single site would be selected for the interim facility and another site would be selected for the permanent facility. However, at this time it is not known which sites would ultimately be selected. The Interim Facility would support current C2ISR operations which have outgrown existing facilities, and house approximately 600 new personnel expected by FY14. Following completion of the permanent facility, 540 existing C2ISR employees and the approximately 600 employees occupying the interim facility would relocate to permanent facility. Construction of the permanent and interim facilities at any of the sites under consideration would result in a minor, permanent effect on site topography and minor, temporary effects on air quality, solid waste generation, noise, and transportation, and beneficial effects on the socioeconomic environment. Operation of the proposed permanent and interim facilities at any of the sites under consideration would result in minor, permanent adverse impacts to water supply and drinking water, air quality, wastewater generation, solid waste generation, and transportation, and beneficial effects on the socioeconomic environment.

Georgia-Robins Aerospace Maintenance Partnership (G-RAMP) Aerospace Industrial Complex (proposed)

The City of Warner Robins proposes to construct a new aerospace industrial complex adjacent to the northern property boundary of Robins AFB. The complex would include hangar facilities, ramp space, public infrastructure, and office/professional space for program management. The complex would be located on an approximately 24.5-acre parcel owned by the City. Improvements

would consist of site preparation and grading, infrastructure improvements such as water and sanitary sewer systems to serve the facility, development of a taxiway extension/connection to the Robins AFB runway, aircraft parking areas, a vehicular access road, and construction of hangar facilities to support Robins AFB and private contractors. Approximately 450,000 cubic yards of earthwork would be moved during site development (mass grading) to allow a finished floor elevation of approximately 266 feet (ASL). Implementation of the Proposed Action would result in an increase in the volume of storm water runoff because construction activities would result in an increase of impervious surface within the project site. A storm water treatment pond would be located within the proposed complex. Storm water sheet flow from the northern and northwestern portions of the project site would flow east, northeast, or southeast toward the Ocmulgee River floodplain. Storm Water sheet flow from the southern and southwestern portions of the project site would flow west or south toward Robins AFB where water would collect and flow into storm water management system catch basins on the northern side of the runway and discharge to the Ocmulgee River floodplain. Implementation of the Proposed Action would not cause significant adverse or positive effects on storm water because permitting and environmental requirements would be met and appropriate BMPs for protecting surface water from sedimentation effects would be in place during construction.

Based on this analysis, the construction and operation of these projects would not result in any significant cumulative impacts on the environment. Potential direct and cumulative effects of the above-listed projects would be addressed through environmental reviews, existing permit requirements, and by permit modifications as necessary.

Construction of the GPW, AMFS, and the O&M demolition has been completed. If constructed simultaneously, the SFF, AFRC HQ, C2ISR, G-RAMP complex, other Solar PV Facilities and the Proposed Action would have insignificant cumulative adverse effects on air quality, solid waste, the noise environment, and transportation.

Construction and decommissioning of the Proposed Action, when added to the other projects under consideration, would not have a cumulative impact on any other environmental components. Although the total area of impermeable surfaces on Robins AFB would increase, compliance with the ESPC would avoid any adverse impact to storm water or surface water. Site-specific design features would be employed at each of the individual project sites to limit the volume and rate of storm water runoff, so the cumulative effect from storm water volume and quality would be insignificant. Further,

construction activities would likely be carried out under different schedules and would include appropriate BMPs, thereby precluding significant cumulative adverse effects on the environment. Construction of all of the projects would have a minor beneficial effect on the socioeconomic environment.

The most notable cumulative effects resulting from the construction of the AMFS, SFF, AFRC HQ, C2ISR, G-RAMP complex, and the Proposed Action would relate to air quality and traffic. If construction of these projects were to occur simultaneously, there would be an insignificant cumulative adverse effect on air quality due to the increase in CO, FGs, and NO_x emissions from construction employee traffic and operation of heavy equipment, but these emissions would be both minor and temporary. Construction workers would be required to follow appropriate routes and observe Robins AFB and OSHA safety rules during transit to the sites, and the Base would require construction personnel to implement actions consistent with governing regulations to ensure worker health and safety during construction. Further, it is unlikely that the projects would be constructed simultaneously, and, in this case, construction of the projects would not result in any cumulative adverse impact on air quality or traffic.

During operation, the projects would have a cumulative, beneficial effect on the socioeconomic environment and safety. Effects associated with the Proposed Action, when added to the other projects under consideration, would not have a cumulative impact on any other environmental component. Operation and decommissioning of the Proposed Action would include additional financial expenditures resulting in a beneficial impact on the socioeconomic environment. This effect, when viewed in the context of the additional jobs created by the other projects under consideration, would represent a cumulative benefit to the socioeconomic environment. The generation and subsequent use of renewable energy from the grid would contribute to regional beneficial effects on the environment from reduction in the use of fossil fuels and related air emissions.

5.0 LIST OF PREPARERS

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6.0 PERSONS CONTACTED

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APPENDICES

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APPENDIX A
ROBINS AIR FORCE BASE BACKGROUND INFORMATION

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APPENDIX B
AGENCY/PUBLIC CORRESPONDENCE

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APPENDIX C
SOLAR GLARE ANALYSIS

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Category	Description	Acres	Percent of Base Total
PUBHx	Unconsolidated bottom, permanent flooding, excavated	38.2	<1
PUSCx	Unconsolidated shore, seasonal flooding, excavated	1.2	<1
X	Other miscellaneous wetlands	68.4	1
Upland	Non-flooded, non-wetland habitats	4,813.4	68.1
	Total	7,069.4	100

Source: EA (1995). Acreage based on GIS for Robins AFB and includes fee-owned acreage.

3.2 Geology and Soils

A wide variety of soil series and soil types are present on Robins AFB due to the existence of gently-sloping uplands, steep bluffs, upland wetlands, organic floodplain wetlands, and non-organic floodplain wetlands. The former Soil Conservation Service, now the USDA Natural Resources Conservation Service, conducted a Soil Survey of Robins AFB in 1989 (USDA, 1989). Sixteen soil series and nine complexes were mapped on the base. A soil series is the lowest category of the U.S. system of soil taxonomy and is made up of soils that are almost alike. A soil complex consists of two or more soil series intermixed at a scale too small to be individually delineated on a soil survey map. On the base there are seven upland soil series, seven lowland or floodplain series, two non-series-specific soil groups (hydraqents and udorthents), and four urban land complexes. The acreage covered by each soil type and its percentage of the total area of the base are presented in **Table 3-2**.

Table 3-2. Soil Series, Acreage and Proportionate Extent of Soils

Map Symbol	Soil Name	Slope (%)	Acres	% of Base Area
1E	Ailey loamy sand	8-25	111.49	1.58
2B	Bonifay loamy sand	2-5	86.94	1.23
4	Chastain loamy frequently flooded	0-2	793.85	11.23
6A	Dothan loamy sand	0-2	298.56	4.22
6B	Dothan loamy sand	2-5	39.09	0.55
7B	Fuquay loamy sand	0-5	252.32	3.57
7C	Fuquay loamy sand	5-8	39.29	0.56
8	Grady loam sand ponded		32.56	0.46
9	Hydraqents frequently flooded		575.3	8.14

Map Symbol	Soil Name	Slope (%)	Acres	% of Base Area
10	Kingsland mucky peat frequently flooded		483.39	6.84
11	Lynchburg sandy loam		14.56	0.21
12	Ocilla loamy sand rarely flooded	0-2	43.40	0.61
13B	Orangeburg loamy sand rarely flooded	2-5	37.28	0.53
14	Osier-Kinston complex frequently flooded		13.24	0.19
15	Tawcaw silt loam frequently flooded		294.73	4.17
17	Udorthents	0-15	46.49	0.66
18A	Urban land-Dothan complex	0-2	141.06	2.00
18B	Urban land-Dothan complex	2-5	154.31	2.18
18C	Urban land-Dothan complex	5-8	3.58	0.05
19B	Urban land-Fuquay complex	0-5	1,570.13	22.21
19C	Urban land-Fuquay complex	5-8	135.75	1.92
20A	Urban land-Orangeburg complex	0-2	22.40	0.32
20B	Urban land-Orangeburg complex	2-5	83.18	1.18
20C	Urban land-Orangeburg complex	5-8	58.98	0.83
21	Urban land-Udorthents complex	0-15	1,632.46	23.09
22	Not surveyed		61.95	0.88
W	Water		42.98	0.61
	Total		7,069.27	100

Source: EA (1995). Acreage based on GIS data for Robins AFB and includes fee-owned acreage.

3.3 Groundwater

Aquifers

The groundwater units at Robins AFB are designated, in descending order, as follows:

- Surficial aquifer
- Quaternary alluvial aquifer
- Upper Providence
- Lower Providence
- Cusseta (aquitard)
- Blufftown aquifer

The Quaternary alluvial aquifer consists of peat, clay, sand, and gravel layers that overlie the Providence unit in the Ocmulgee River floodplain areas. The Quaternary unit is exposed along the east side of Robins AFB, generally in the area designated as wetlands, and pinches out to the west. In most areas, the alluvium is in direct hydraulic communication with the underlying Providence aquifer, and in places it is difficult to distinguish between the two units lithologically.

The Providence aquifer consists of fine- to coarse-grained sands with interlayered silts and clays. The Providence outcrops over the west side of the base and underlies the Quaternary alluvial aquifer to the east. The Providence is subdivided by Robins AFB into upper and lower units. This has been done primarily because of the aquifer's thickness and because this subdivision facilitates discussions of hydrogeology and the extent of groundwater contaminant plumes. Robins AFB further divides the upper Providence into three subunits for the purpose of contaminant plume mapping in the "Greater Base Industrial Area". Portions of the surficial and Quaternary aquifers are also classified within these subunits.

Below the Providence aquifer is the Cusseta unit, which acts as a semi-confining bed to the underlying Blufftown aquifer. The Cusseta is reported to include two fingers of clay, each 10- to 15-feet thick, separated by a sandy zone 30- to 40-feet thick. Few wells are screened into the Cusseta unit.

The Blufftown aquifer, comprised of the Eutaw-Blufftown geologic units, forms an exceptionally thick (thought to exceed 350 feet), productive aquifer. The Blufftown is underlain by igneous and metamorphic rocks which are equivalent to those of the Georgia Piedmont. Potable and process waters are produced from the Blufftown aquifer at a number of water supply wells at Robins AFB.

Groundwater in the shallow aquifers (surficial, Quaternary alluvial, and upper Providence) at Robins AFB flows from west to east toward the Ocmulgee River. Groundwater in the upper Providence flows laterally from west to east and eventually either underflows or discharges vertically upward into the approximately 20 to 30 foot thick Quaternary alluvial aquifer.

Groundwater flow direction in the Quaternary alluvial aquifer is generally the same as in the upper Providence. In places, the water table is locally mounded where surficial materials (such as landfills) or impoundments (such as Duck Lake, Scout Lake and Lake Luna) provide additional recharge.

Groundwater movement in the lower aquifers also is from west to east. Flow in the lower Providence and Blufftown aquifers is similar to that described for the upper Providence aquifer. Along the western half of the base, downward gradients occur between the upper and lower Providence and, to a lesser extent, between the lower Providence and Blufftown. Vertical

movement between strata is thought to be restricted by discontinuous clay units which occur throughout the Providence Formation. The clay units within the Cusseta are thought to form an aquitard, which restricts the amount of groundwater flow between lower aquifers. Along the eastern side of Robins AFB, beneath the Ocmulgee River floodplain, upward flows are induced from the lower Providence and Blufftown aquifers into the shallower aquifers.

3.3.1 Water Supply and Drinking Water

Robins AFB operates its own public water supply system under State of Georgia Permit No. CG1530042. All water supplied to the base is obtained from groundwater wells. The system receives water from seven (six currently active) water supply wells installed at Robins AFB between May 1956 and 2004, all of which produce water from the Blufftown aquifer. The capacity of the public supply wells is 10.4 million gallons per day (MGD); however, constant use at this rate is not possible due to permit withdrawal limitations. Daily average water use during the 2010 was 1.44 million gallons. The water supply system provides water for irrigation, industrial processes, and drinking water to a population of approximately 2,965 on-base residents and to the base workforce of approximately 21,000 civilian and military personnel.

An additional potable water well is used strictly for recreational purposes and fills one of the lakes located at Robins AFB.

3.4 Climate

The central region of Georgia, including Robins AFB, is located within a moist, subtropical, mid-latitude climate zone. The average weather in this climate is characterized by long, warm, humid summers and short, mild winters. Yearly precipitation patterns may vary greatly, but typically there are two annual peaks: midsummer and late winter/early spring. The midsummer rainfall peak typically results from thunderstorms. The late winter/early spring peak typically results from cyclonic storms that regularly move through the region during this period, drawing in moisture from the Gulf of Mexico. Autumn typically is the driest season in this region (NOAA, 1982).

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4.0 AIR QUALITY

4.1 Regional Air Quality

The State of Georgia is classified as in attainment for all of the National Ambient Air Quality Standards (NAAQS) criteria pollutants except for 1997 8-hour ozone (O_3) and 1997 particulate matter (PM) 2.5. Air quality in Houston County, which includes Robins AFB, is currently classified as an attainment area (i.e., pollutant levels are below the NAAQS standards). The nearby Macon Nonattainment Area, which includes Bibb County and a portion of Monroe County, was redesignated as a maintenance area for 8-hour O_3 in June 2007 (Federal Register, 2007), and, in March 2011, the USEPA proposed that the Macon Area has attained the 1997 annual PM 2.5 standard.

4.2 Air Emission Sources

Not relevant to this EA.

4.3 Air Quality Requirements at Robins AFB

Not relevant to this EA.

4.4 References

Federal Register. 2007. *Approval and Promulgation of Implementation Plans and Designation of Areas for Air Quality Planning Purposes: Georgia: Redesignation of Macon, Georgia 8-Hour Ozone Nonattainment Area to Attainment for Ozone*. Vol. 72, No. 181, Page 53432. September 19, 2007.

5.0 BIOLOGICAL ENVIRONMENT

The biological environment and ecology of Robins AFB have been summarized in the *Integrated Natural Resources Management Plan* (INRMP) (RAFB, 2007). Appendices of the INRMP list all flora and fauna known to occur on Robins AFB and contain maps indicating locations of known natural resources. The INRMP serves as a decision-making tool on environmental issues and serves as the basis of natural resource management. Relevant information is incorporated herein by reference.

5.1 Flora

This section describes the flora of the study area, and the description is organized on the basis of vegetation communities. Subsequently, management of the forest communities on the base is discussed.

5.1.1 Communities

The diversity of vegetation communities on Robins AFB reflects the edaphic (soil) and topographic diversity of the site, as well as man's impact on the area. Natural communities can be categorized in a variety of ways. The Georgia Department of Natural Resources (DNR) conducted a rare species and natural communities study of Robins AFB (Heyman, 1994) that categorized and mapped the communities. Alternatively, for the purposes of this discussion the vegetation communities on the base are categorized into 11 main types, including six upland communities, four lowland or floodplain communities, and communities in disturbed areas. Each community type is discussed below.

- 1) Loblolly Pine Forest. Most of the forested upland areas of the base are dominated by loblolly pine (*Pinus taeda*). Young, middle-aged, and mature stands of trees are scattered throughout

Robins AFB. Most of these stands have been planted or are the result of selectively cutting or partially clearing natural stands. In the more natural stands, an understory is present that includes sweet gum (*Liquidambar styraciflua*), water oak (*Quercus nigra*), and, sometimes, dogwood (*Cornus florida*). In disturbed stands in neighborhoods and along golf courses, the understory is usually open with exotic grasses planted in the herbaceous layer.

2) Longleaf Pine Forest. The natural vegetation of Robins AFB probably included extensive stands of longleaf pine (*Pinus palustris*). Today, however, only one longleaf pine stand can be found on Robins AFB. Heyman (1994) described this stand as a "relict successional" longleaf pine forest where fire suppression has allowed for the invasion of loblolly pine and hardwood species. The stand is being restored. The site has been harvested, excluding the mature longleaf pine seed trees; longleaf pine seedlings have been planted; forestry herbicides are applied as needed to control competing understory plant species; and prescribed burning has been implemented to reestablish the longleaf pine-wiregrass (*Astrida* sp.) community.

3) Pine/Mixed Hardwood Forest. Successional stands of loblolly pine with hardwoods in the canopy are scattered around Robins AFB. Some stands occur on the southern portion of the base in a transition zone of uplands and low bluffs where the upland grades into the floodplain and wetlands along Sandy Run Creek. In these areas, loblolly pine, water oak, upland laurel oak (*Quercus hemisphaerica*), sweet gum, southern red oak (*Quercus falcata*), and, rarely, beech (*Fagus grandifolia*) are present.

4) Mixed Hardwood Forest. Most of the mixed hardwood stands are found on bluffs overlooking the Ocmulgee River floodplain. There are a few mixed hardwood stands along the low slopes north of Sandy Run Creek and on a ridge running northwest-southeast across the Ocmulgee floodplain (see below). The best examples of hardwood bluffs are along Fort Valley Street and Crescent Drive and just below the fifth hole of the Robins AFB golf course. Canopy species in these stands include mature white oak (*Quercus alba*), water oak, tulip poplar (*Liriodendron tulipifera*), beech, laurel oak (*Quercus laurifolia*), mockernut hickory (*Carya tomentosa*), and bluff white oak (*Quercus austrina*), which is uncommon in Georgia. Red buckeye (*Aesculus pavia*), dwarf pawpaw (*Asimina parviflora*), dogwood, and several invading exotics [most commonly Japanese honeysuckle (*Lonicera japonica*)] are in the understory. Heartleaf (ginger) (*Hexastylis arifolia*), Solomon's seal (*Polygonatum biflorum*), Indian pink (*Spigelia marilandica*), bloodroot (*Sanguinaria canadensis*), yellow passion flower (*Passiflora lutea*), and ruellia (*Ruellia carolinensis*) were among the most common herbs seen on one mixed hardwood bluff in early June. The Ocmulgee skullcap (*Scutellaria ocmulgee*), which is threatened in Georgia and is a federal candidate species (Patrick et al., 1995), and needle-palm

(*Rhipidophyllum hystrix*), which is uncommon in Georgia, are found on the hardwood bluffs of Robins AFB (Heyman, 1994).

5) Swamp Tupelo Depression. Several small upland depressions dominated by Grady soils are scattered in the southern portion of Robins AFB. Often referred to as "gum ponds," these forested swamps are dominated by the presence of swamp tupelo or swamp black gum (*Nyssa biflora*). Sweet bay (*Magnolia virginiana*), sweet gum, laurel oak, black willow (*Salix nigra*), tulip poplar, and red maple are also common in this vegetation type. Joor's sedge (*Carex joorii*), *Carex lupuliformis*, bladderworts (*Utricularia* spp.), and Tracy's beakrush (*Rhynchospora tracyi*) are among the herbaceous flora found here (Heyman, 1994). Swamp tupelo also occurs in organic depressions in the Ocmulgee floodplain and in the mucky soils along Sandy Run Creek (see below).

6) Depression Meadow. This community is located in an upland depression just south of Scout Lake. This wetland meadow plant community of graminaceous/herbaceous species occurs on wet Grady soil. It is dominated by seedboxes (*Ludwigia* spp.), needlerushes (*Juncus* spp.), meadowbeauties (*Rhexia* spp.), and panic grasses (*Panicum* spp.). Awned meadowbeauty (*Rhexia aristosa*) is common here but is rare in Georgia (Heyman, 1994).

7) Mixed Hardwood Floodplain Ridge. In the floodplain of the Ocmulgee River, a ridge extends northwest-southeast across the floodplain near the PAVE-PAWS facility. A road and a gasline follow the crest of this low ridge, which is probably less than 10 feet above the level of the floodplain. A mixed hardwood and mixed hardwood-pine community is present on this ridge. Although only a few mature trees remain in this community type, it is reminiscent of what early authors called the "climax" vegetation of the richer sites in the Atlantic Coastal Plain: beech-magnolia-holly forest (Quarterman and Keever, 1962). Wharton (1978) pointed out that sometimes such forests are called "beech-magnolia hammocks." Water oak, pignut hickory (*Carya glabra*), beech, loblolly pine, red maple (*Acer rubrum*), and southern magnolia (*Magnolia grandiflora*) are the dominant canopy trees. In the understory, dogwood, American holly (*Ilex opaca*), sweetleaf (*Symplocos tinctoria*), and Elliott's blueberry (*Vaccinium elliottii*) are common. The herbaceous layer, like that of the more upland mixed hardwood communities, is diverse. Creeping ginger (*Hexastylis arifolia* var. *pittmanii*), the rare Harper's bog heartleaf (*Hexastylis shuttleworthii* var. *harperi*), a skullcap (*Scutellaria* sp.), Indian cucumber root (*Medeola virginiana*), partridgeberry (*Mitchella repens*), Florida sedge (*Carex floridana*), and an unidentified sedge (*Carex* sp.) are common.

8) Mixed Bottomland Hardwood Forest. This community is found generally on Tawcaw soils in flats in the Ocmulgee River floodplain. Sweet gum, laurel oak, cherrybark oak (*Quercus*

pagoda), and American elm (*Ulmus americana*) typically are the dominant canopy trees in seasonally-flooded areas. In lower areas, overcup oak (*Quercus lyrata*), green ash (*Fraxinus pennsylvanica*), red maple, and water hickory (*Carya aquatica*) are present. Common understory vegetation includes American hornbeam (*Carpinus caroliniana*), cane (*Arundinaria gigantea*), American holly, and dwarf palmetto (*Sabal minor*) (Wharton, 1978). Woody vines dominate the herbaceous layer in bottomland hardwood communities. Peppervine (*Ampelopsis arborea*), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*Rhus radicans*), muscadine (*Vitis rotundifolia*), and cross vine (*Bignonia capreolata*) are all common here. Floodplain forests are also extremely rich in sedge (*Carex* spp.). Some bottomland hardwood forest like that on Robins AFB may contain as many as 20 species of *Carex*.

9) Water Tupelo, Water Tupelo-Bald Cypress Forest. In the deepest sloughs and depressions in the Ocmulgee floodplain, often on Chastain soils, water tupelo (*Nyssa aquatica*) forms pure stands or grows with bald cypress (*Taxodium distichum*). Swamp tupelo, water ash (*Fraxinus caroliniana*), and water elm (*Planera aquatica*) also are tree species of this semipermanently-flooded community (Wharton, 1978; Heyman, 1994). Trumpet creeper (*Campsis radicans*), swamp dayflower (*Commelina virginica*), and lizard's tail (*Saururus cernuus*) are common species of the herbaceous layer.

10) Organic Swamp. The soils of the floodplain of Sandy Run Creek are composed of Kingsland mucky peat and, unlike the Ocmulgee floodplain, are derived from decaying organic matter. The pH of this organic swamp is higher than that of most of the Ocmulgee floodplain, resulting in a different type of vegetation community. Swamp tupelo, red maple, sweet bay, red bay (*Persea palustris*), tulip poplar, sweet gum, and laurel oak are the dominant canopy trees. American holly, doghobble (*Leucothoe axillaris*), fetterbush (*Lyonia lucida*), cane, and winterberry (*Ilex verticillata*) are common in the understory and shrub layer. Common herb layer species include netted chain fern (*Woodwardia areolata*), cinnamon fern (*Osmunda cinnamomea*), and royal fern (*Osmunda regalis*). Harper's bog heartleaf and oval lady's-tresses (*Spiranthes ovalis*), both rare species in Georgia (Georgia DNR, 1997a), are found in the Sandy Run creek swamp community (Heyman, 1994). Organic swamp vegetation also is found where Sandy Run Creek empties into the Ocmulgee floodplain and is occasionally found in seepage depressions along the bluffs of the Ocmulgee floodplain (Wharton, 1978).

11) Disturbed Area Communities. In areas that have been disturbed by human or animal activity, variations of the above vegetation types may be found. Where floodplains have been cleared and along floodplain roads, graminaceous/herbaceous communities dominate; where beaver ponds exist, floating and marsh vegetation are present; and where bluffs have been cleared, weedy vegetation dominated by exotic plants occurs.

5.1.2 Forest Management

Not relevant to this EA.

5.2 Fauna

Wildlife species representative of the fauna of the study area are described in this section, and the description is organized on the basis of habitats. Subsequently, wildlife management on the base is discussed.

5.2.1 Habitats and Species

Representative listings of animal species characteristic of the major habitats on Robins AFB are provided in the following paragraphs. The species identified are derived from lists of animal species (vertebrates) likely to inhabit the habitats of Robins AFB provided in Heyman (1994), USDA (1989), and Hamel et al. (1982), available from the U. S. Forest Service. For birds, a letter following the species name indicates whether local populations are breeding (B) or wintering (W) only populations.

Pine and Pine/Mixed Hardwood Forest Habitats. In these habitats of the Coastal Plain, Wharton (1978) reported mole (*Ambystoma talpoideum*), flatwoods (*Ambystoma cingulatum*), and marbled (*Ambystoma opacum*) salamanders to be common amphibians. The most commonly encountered snakes were the king (*Lampropeltis getulus getulus*), corn (*Elaphe guttata guttata*), ribbon (*Thamnophis sauritus*), garter (*Thamnophis sirtalis sirtalis*), timber rattlesnake (*Crotalus horridus atricaudatus*), and black racer (*Coluber constrictor priapus*). The small mammal fauna of these habitats is poorly known, but does contain the least shrew (*Cryptotis parva*) and the short-tailed shrew (*Blarina brevicauda*). Larger mammals known from this habitat type in the Coastal Plain include the fox squirrel (*Sciurus niger*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), opossum (*Didelphis virginianus*), and cottontail rabbit (*Sylvilagus floridanus*) (Wharton, 1978). Hamel et al. (1982) list the characteristic birds of this habitat type as the eastern pewee (*Contopus virens*) (B), Carolina chickadee (*Parus carolinensis*) (B), red-breasted nuthatch (*Sitta canadensis*) (W), brown-headed nuthatch (*Sitta pusilla*) (B), brown creeper (*Certhia americana*) (W), golden-crowned kinglet (*Regulus satrapa*) (W), ruby-crowned kinglet (*Regulus calendula*) (W), pine warbler (*Dendroica pinus*) (B), and northern junco (*Junco hyemalis*) (W).

Mixed Hardwood Forest Habitats. These plant communities are known to provide habitat for the southern dusky salamander (*Desmognathus auriculatus*), cricket frog (*Acris gryllus*), pine woods treefrog (*Hyla femoralis*), broad-headed skink (*Eumeces laticeps*), southern ringneck snake (*Diadophis punctatus punctatus*), gray rat snake (*Elaphe obsoleta spilooides*), scarlet king snake

(*Lampropeltis triangulum elapsoides*), and crowned snake (*Tantilla coronata*) (Wharton, 1978). Mammals that inhabit this community generally include the same species found in pine communities (see above). Characteristic birds of mixed hardwoods include the pileated woodpecker (*Dryocopus pileatus*) (B), red-bellied woodpecker (*Melanerpes carolinus*) (B), great crested flycatcher (*Myiarchus crinitus*) (B), blue jay (*Cyanocitta cristata*) (B), tufted titmouse (*Parus bicolor*) (B), Carolina wren (*Thryothorus ludovicianus*) (B), hermit thrush (*Catharus guttatus*) (W), and northern cardinal (*Cardinalis cardinalis*) (B) (Hamel et al., 1982).

Organic Swamp Habitats. Organic swamps are known to provide habitat for amphibian and reptile species that include the many-lined salamander (*Stereochilus marginatus*), southern dusky salamander (*Desmognathus auriculatus*), two-lined salamander (*Eurycea bislineata cirrigera*), amphiuma (*Amphiuma means*), sirens (*Siren spp.*), rainbow snake (*Farancia erythrogramma*), cottonmouth (*Agkistrodon piscivorus*), and spotted turtle (*Clemmys guttala*), an uncommon species. Little is known of the mammal fauna of this habitat type. Hamel et al. (1982) list as the characteristic birds of this type the red-bellied woodpecker (B), winter wren (*Troglodytes troglodytes*) (W), Carolina wren (B), American robin (*Turdus migratorius*) (W), hermit thrush (*Catharus guttatus*) (W), yellow-rumped warbler (*Dendroica coronata*) (W), white-throated sparrow (*Zonotrichia albicollis*) (W), and fox sparrow (*Passerella iliaca*) (W).

Floodplain Habitats. The fauna of mixed bottomland hardwood, water tupelo-bald cypress, and other lowland floodplain habitats includes both aquatic and terrestrial species. Dahlberg and Scott in Wharton (1978) list 57 species of fish from the Ocmulgee River drainage in Georgia. The amphibian fauna is known to include the bird-voiced treefrog (*Hyla avivoca avivoca*), which is restricted to floodplains (and has been recently heard calling in the Ocmulgee floodplain on Robins AFB), the bronze frog (*Rana clamitans clamitans*), the bull frog (*Rana catesbeiana*), and the carpenter frog (*Rana virgatipes*) (Wharton, 1978). Reptiles in this habitat include the rainbow snake, cottonmouth, and yellow-bellied turtle (*Chrysemys scripta scripta*) (Wharton, 1978).

Large mammals known to occur in floodplain habitats of the Coastal Plain include the black bear (*Ursus americanus*) (recently reported from the Ocmulgee floodplain and Sandy Run Creek on Robins AFB), feral pig (*Sus scrofa*), raccoon (*Procyon lotor*), opossum, swamp rabbit (*Sylvilagus aquaticus*), beaver (*Castor canadensis*), river otter (*Lutra canadensis*), and white-tailed deer (*Odocoileus virginianus*). Characteristic birds of floodplains in the southeastern United States include the American woodcock (*Scolopax minor*) (B), yellow-billed cuckoo (*Coccyzus americanus*) (B), barred owl (*Strix varia*) (B), pileated woodpecker (B), red-bellied woodpecker (B), red-shouldered hawk (*Buteo lineatus*) (B), bald eagle (*Haliaeetus leucocephalus*) (W), osprey (*Pandion haliaetus*) (W), acadian flycatcher (*Empidonax virescens*)

(B), Carolina wren (B), American robin (W), white-throated sparrow (W), tufted titmouse (B), red-eyed vireo (*Vireo olivaceus*) (B), blue-gray gnatcatcher (*Polioptila caerulea*) (B), prothonotary warbler (*Protonotaria citrea*) (B), northern parula warbler (*Parula americana*) (B), yellow-rumped warbler (W), and yellow-throated warbler (*Dendroica dominica*) (B) (Hamel et al., 1982).

5.2.2 Wildlife Management

Not relevant to this EA.

5.3 Endangered, Threatened, and Sensitive Species

The Georgia Department of Natural Resources (DNR) has compiled lists of the endangered, threatened, and sensitive (ETS) plant and animal species of the state. *Protected Plants of Georgia* (Patrick et al., 1995) lists plant species that are officially protected by state law. The Georgia DNR also publishes tracking lists for plants and animals of special concern in the state (Georgia DNR, 2011a; 2011b).

Heyman (1994) produced lists of potentially occurring ETS species in Houston County, Georgia as part of a Georgia DNR rare species and natural communities study of Robins AFB. Heyman (1994) did not find any ETS animal species on Robins AFB during her study. The Soil Conservation Service (SCS), now the Natural Resource Conservation Service, reported (USDA, 1989) several ETS animal species as occurring on Robins AFB. They reported the bald eagle (formerly federally listed as threatened and state-listed as endangered) as a late winter and summer visitor to open water (probably the Ocmulgee River). SCS also listed several fish species that are rare in the state of Georgia as being known from the river or creeks on Robins AFB: the goldstripe darter (*Etheostoma parvipinne*) and redeye chub (*Notropis harperi*) – both state-listed as rare, the golden top minnow (*Fundulus chrysotus*), the Ocmulgee shiner (*Cyprinella callisema*), and the sailfin shiner (*Pteronotropis hypselopterus*). These earlier ETS surveys were updated in 1999 and 2000 by a rare plant survey and management plan (Rust, 1999) and a threatened and endangered animal species survey (Rust, 2000). Reptiles and amphibians were surveyed in 2003 and, although several new species were recorded, there were no reptile or amphibian ETS present (URS, 2003b). A botanical report in 2004 updated and consolidated previous plant surveys on Robins AFB (URS, 2004b).

One plant species found on Robins AFB currently is protected by state law: the Ocmulgee skullcap (*Scutellaria ocmulgee*) is state listed as threatened in Georgia. At Robins AFB, it occurs on the hardwood bluffs overlooking the Ocmulgee River floodplain. Nine other rare plants of concern found on Robins AFB are tracked by the state, but not legally protected. Six of

these species, Awnpetal meadowbeauty (*Rhexia aristosa*), Boykin's lobelis (*Lobelia boykinii*), white doll's daisy (*Boltonia asteroides*), black-seeded spikerush (*Eleocharis melanocarpa*), Robbin's spikerush, (*Eleocharis robbinsii*), and quillwort arrowhead (*Sagittaria isoetiformis*) are found in the depression meadow south of Scout Lake. This site appears to be the only habitat for these species on Robins AFB. Harper's bog heartleaf (*Hexastylis shuttleworthii* var. *harperi*) was found along the margins and within the creek swamp along Sandy Run Creek by Heyman (1994) and since has been found along the margins of the Ocmulgee floodplain (Gaddy, unpublished data) and at other locations on Robins AFB.. The remaining two rare plants of concern, October ladyies'-tresses (*Spiranthes ovalis*) and Southern peat moss sedge (*Carex lonchocarpa*), were found by Heyman (1994) in the floodplain of Sandy Run Creek on Robins AFB.

In addition to the identification of individual species of concern, significant natural communities also have been identified on Robins AFB. The Natural Resources Plan for Robins AFB, produced by the SCS (USDA, 1989), documented several noteworthy plant community types on Robins AFB, and Heyman (1994) described eight significant natural communities on the base. Heyman (1994) listed the following areas/community types as significant: 1) old growth bottomland hardwood swamp (in the floodplain of the Ocmulgee); 2) creek swamp (in Sandy Run floodplain); 3) bay swamp (an organic swamp at the margin of the Ocmulgee floodplain); 4) gum-cypress pond (a beaver-maintained floodplain wetland); 5) gum pond (an upland pond near Sandy Run Creek); 6) Grady freshwater meadow (a depression meadow on Grady soils south of Scout Lake); 7) relict upland hardwood bluff forest (the hardwood bluffs overlooking the Ocmulgee floodplain along Crescent Drive, Fort Valley Street, and Hannah Road); and 8) relict successional longleaf pine forest. The beech-southern magnolia-holly community on the ridge that extends southeastward into the floodplain of the Ocmulgee probably constitutes another significant natural area or community.

5.4 References

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6.0 CULTURAL RESOURCES

Cultural resources include prehistoric and historic sites, structures, artifacts, districts or any other physical evidence of human activities considered important to a culture or community for scientific, traditional, religious, or other reasons. Cultural resources include prehistoric and historic archaeological resources, as well as architectural resources. Prehistoric resources are evidences of human activity that predate the advent of written records in the region. Historic archaeological resources include campsites, roads, battlegrounds, and a variety of other structures from the period of recorded history in the region. Architectural resources include structures or districts of historic or aesthetic significance, such as buildings, bridges, and dams. To be considered for protection, such architectural structures normally must be more than 50 years old. However, more recent structures, such as those constructed during the Cold War era, may warrant protection if they manifest the potential to gain significance in the future. According to the terminology of the National Historic Preservation Act of 1966, all of the above cultural resources may be considered historic properties.

6.1 Regulatory Requirements

The need for Robins AFB to properly treat cultural resources is derived from various acts, agreements, and Air Force instructions, regulations, and directives, including:

- Antiquities Act of 1906
- Historic Sites Act of 1935

- National Historic Preservation Act of 1966, as Amended
- Architectural Barriers Act of 1968, as Amended
- National Environmental Policy Act of 1969, as Amended
- Executive Order 11593, Protection and Enhancement of the Cultural Environment
- Archaeological and Historic Preservation Act of 1974
- Public Buildings Cooperative Use Act of 1976
- American Indian Religious Freedom Act of 1978
- Archaeological Resources Protection Act of 1979, as Amended
- Native American Graves Protection and Repatriation Act of 1990
- Religious Freedom Restoration Act of 1993
- Native American Free Exercise of Religion Act
- Archaeological and Historic Resources Management (Department of Defense Directive 4710.1)
- Programmatic Memorandum of Agreement among the United States Department of Defense, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers, as Amended
- Memorandum of Agreement for Cooperative Actions in Cultural Resource Management on Military Lands between the Department of Defense and the National Trust for Historic Preservation
- Cultural Resources Management (Air Force Instruction 32-7065)
- Natural Resource: Historic Preservation (Air Force Instruction 126-7)
- Environmental Quality (Air Force Policy Directive 32-70)

6.2 Known Cultural Resources

Under Section 110 of the National Historic Preservation Act (16 USC 470h-2), Robins AFB has been given the responsibility of conducting a cultural resources inventory and evaluation of all of its holdings. The upland portions of the installation have been completely surveyed for archaeological sites and historic structures/districts, and the survey work has been reviewed and accepted by the Georgia SHPO. Robins AFB has a total of 16 archaeological sites eligible for listing on the National Register of Historic Places (NRHP). The historical/architectural survey of the base examined all structures on base and Robins AFB has a total of 22 buildings recommended as eligible for the NRHP. One historic district (7 structures) and 15 additional individual buildings also have been recommended as eligible for inclusion on the NRHP (**Table 6-1**). Although recommended for listing, but not formally listed on the NRHP, Robins AFB's policy is to manage these cultural resources as if they were listed on the NRHP.

Table 6-1. NRHP Eligible Historic Structures and Districts on Robins AFB.

Resource	Description	NRHP Status
Crew Readiness Facility (Building 12)	Altered, but contains Cold War significance, constructed in 1960.	Eligible. SHPO concurs.

Resource	Description	NRHP Status
Armaments Production/Assembly Facility (Building 94)	Built in 1960.	Eligible. SHPO concurs.
Munitions Storage Facility (Building 97)	Built in 1960.	Eligible. SHPO concurs.
Munitions Storage Facility (Building 98)	Built in 1960.	Eligible. SHPO concurs.
Munitions Storage Facility (Building 105)	Built in 1960.	Eligible. SHPO concurs.
Munitions Storage Facility (Building 106)	Built in 1960.	Eligible. SHPO concurs.
Sentry Police Administration Facility (Building 107)	Built in 1960.	Eligible. SHPO concurs.
Control Tower and Operations Hangars (Building 110)	The original control tower/operations building, built in 1942.	Eligible. SHPO concurs.
Maintenance Hangar (Building 125)	Largest building at Robins AFB, constructed in 1942.	Eligible. SHPO concurs.
Original Post Headquarters (Building 220)	The original base headquarters, built in 1942.	Eligible. SHPO concurs.
Officer's Circle District (Buildings 400, 405, 410-412, 415, 450)	Five two-story residential buildings and two storage structures constructed 1942; Colonial Revival style.	Eligible. SHPO concurs.
Chief's Circle (Building 500)	Two-story residential duplex building, constructed 1942; Colonial Revival style.	Eligible. SHPO concurs.
PAVE-PAWS Facility (Building 1400)	Surveillance radar, constructed 1986. Contains Cold War significance	Eligible. SHPO concurs.

Resource	Description	NRHP Status
Maintenance Hangar (Building 2067)	Constructed for large aircraft in 1960.	Eligible. SHPO concurs.
Maintenance Hangar (Building 2081)	Constructed for large aircraft in 1960.	Eligible. SHPO concurs.
Munitions Storage Igloo (Building 2108)	Constructed for munitions storage in 1990.	Eligible. SHPO concurs.
Strategic Air Command (SAC) Alert Apron	High alert aircraft pad, runway, and associated features; constructed 1957.	Eligible. SHPO concurs.

In addition to the general requirements for any Air Force facility to preserve cultural resources, Robins AFB has a Programmatic Agreement (PA) that was finalized August 2008 with the Georgia SHPO regarding maintenance activities on historic structures or in historic districts. Stipulations of the PA are followed so that base activities will have no adverse effects on any eligible historic structure or district. The archeological and cultural resources of Robins AFB are summarized in the *Integrated Cultural Resources Management Plan* (ICRMP), effective November 2011.

The ICRMP and the PA specify the constraints on activities in or near the 22 eligible historic structures, the eligible historic district, and the SAC historic features. Basically, no activity is allowed that will detract from the attributes that made the structure or district eligible for the NRHP. If potential adverse effects threaten any eligible resource, and if the undertaking cannot feasibly be redesigned to avoid the effects, the adverse effects are to be mitigated through data recovery investigations and documentation under a plan reviewed and accepted by the SHPO.

7.0 LAND USE

This section describes existing land use conditions on Robins AFB and in surrounding areas and also discusses factors affecting land use.

7.1 On-Base Land Use

Summary tables in the *Current Land Use Assessment* (Geophex, 1997) list facilities according to land use category. The fourteen land use categories used in the *Current Land Use Assessment* are based on the type of facilities occupying a site and the nature of activities that occur there. Twelve of the land use categories are those defined in the *Land Use Planning Bulletin* (USAF,

1986). Two additional categories, cemetery and forest [taken from the Tri-Service Commission Spatial Data Standards (TSSDS)], also are included to better describe land uses at Robins AFB.

Table 7-1 presents the total acreage of the base devoted to each of the fourteen land use categories. The total land area of the base listed in **Table 7-1** is 7,070.9 acres, which includes fee-owned acreage. Including additional off-base lands being used by the base under easements, leases, and temporary use agreements, the total land area used to support the Robins AFB mission is 8,722 acres.

The predominant land uses on Robins AFB are forest and airfield, which together account for almost 58 percent of the total base area. Industrial, accompanied housing, outdoor recreation, and aircraft operations and maintenance occupy another 35 percent of the total base area. The other eight land use categories together occupy the remaining 7 percent of the base.

Following are descriptions of the land use categories and the major facilities in each category:

- 1) Administrative. The administrative land use category (146.4 acres, or 2.1% of total base area) includes military command and tenant activity management, wing/group headquarters, and civilian administrative activities. It also covers security police operations, including gate/visitor management and military operations security. The largest administrative area at Robins AFB is located along the west side of the base, along SR 247. It is concentrated in the vicinity of Gate 2, the main base entrance. These administrative buildings, including WR-ALC headquarters (Building 215) and the worldwide headquarters of the Air Force Reserve (Building 210), are the most prominent feature of the main entrance and serve as the front door of the base. This area is located south and west of aircraft operational maintenance and north and west of industrial land use areas. Other administrative areas are found in the southern part of the base in association with the Community Center.
- 2) Aircraft Operations and Maintenance. The aircraft operations and maintenance land use category (572.3 acres, or 8.1% of total base area) includes all facilities that directly support the flying and maintenance missions of WR-ALC and its tenant organizations. Aircraft operations and maintenance land uses are located mainly in the northern part of the base, east, west, and south of the airfield. This category includes facilities such as maintenance hangars and docks, avionics facilities, air freight terminals, wash racks, and other aircraft maintenance facilities. Additional aircraft operations and maintenance facilities are found in the southern part of the base, including the Avionics Complex, which borders SR 247, and facilities associated with the TI Directorate.
- 3) Airfield. The airfield land use category (1341.1 acres, or 19.0% of total Base area) consists of the entire airfield pavement system (runway, taxiways, aprons, overruns, paved shoulders, and

pads), navigational aids, and related open space. The airfield is located in the northern part of the Base. There are 17 numbered taxiways, seven major parking aprons, and a Hazardous Cargo Pad.

- 4) Cemetery. The cemetery land use category (0.7 acres, or 0.01% of total base area) was developed to meet a need at Robins AFB not met by any of the land use categories defined in the *Land Use Planning Bulletin* (USAF, 1986). It includes two cemeteries: King Cemetery is located in the northwest part of the base near Perimeter Road; Feagin Cemetery is located in the southern part of the base in the community center area, behind the existing child care center off Tenth Street and west of the new child care center.
- 5) Community (Commercial). The community center is the part of the base that functions as the central location for the shopping, service, recreation, and day-to-day living needs of base personnel, their families, and military retirees within the area. The Air Force land use classification system distinguishes between commercial and service community facilities. Community (commercial) facilities include the base Exchange, the Commissary, clubs (e.g., Aero Club, Officers Club, Enlisted Club), dining halls (e.g., Officers Open Mess, NCO Open Mess, base restaurant), Burger King restaurant, personal services such as banks and service station, and indoor recreational facilities such as a theater, bowling center, and gymnasium. The majority of community land use is in the southern part of the base. Community (commercial) land use occupies 82.3 acres, or 1.2% of the total base area.
- 6) Community (Service). The community (service) category (88.1 acres, or 1.2% of total base area) contains the noncommercial activities that are important in day-to-day living. Community (service) land use includes educational facilities, library, Museum of Aviation, chapel, post office, hobby shop, and child care centers. Most of the areas in this land use category are located in the southern part of the base, in the community center. Included are Robins Elementary School and the Education Center (where classes are held by several colleges, including Macon College, Fort Valley State College, Georgia College, Mercer University Engineering School, and Georgia Military College).
- 7) Forest. The forest land use category (2741 acres, or 38.8 % of total base area) includes those areas that contain forest stands and are otherwise vacant. Most of the areas on Robins AFB assigned to the forest land use category (approximately 2,200 acres) are forested wetlands, which represent a major constraint to any potential future use. Forest land use areas are found mainly in the eastern part of the base (associated with the Ocmulgee River floodplain), with smaller areas located at the northern tip and in the southern part of the base in the Sandy Run Creek floodplain.

8) Housing (Accompanied). Accompanied housing (588.5 acres, or 8.3 % of total base area) is family housing and temporary lodging facilities. Areas used for accompanied housing at Robins AFB are located north and east of the community center area. The Turner Park housing development is located north and west of Scout Lake.

9) Housing (Unaccompanied). Unaccompanied housing occupies 36.4 acres, or 0.5% of the total base area. This land use category includes visiting officer's quarters (VOQ), visiting airman's quarters (VAQ), and dormitories. The VOQ are across from the Officer's Club. The VAQ and dormitories are located just north of the community center. The unaccompanied housing areas at Robins AFB are convenient to commercial facilities, services, and outdoor recreation such as golf and parks.

10) Industrial. The industrial land use category (747.3 acres, or 10.6 % of total base area) includes warehouses, base maintenance and utilities functions, and base industrial services such as those belonging to transportation, communications, and civil engineering. The petroleum, oil, and lubricant (POL) yard, open storage, weapons storage, landfills, training areas, and firing ranges fall into this category. Industrial land uses are located throughout Robins AFB. The main industrial area is in the west-central part of the base, south of Second Street, where most of the warehouses are located.

11) Medical. The medical land use category (22.3 acres, or 0.3% of total base area) includes the hospital, medical and dental clinics, medical storage, and veterinarian facilities. These facilities are also used by personnel living off-base and retired military staff. Medical land uses at Robins AFB are closely associated with the community center; the hospital is located directly to the north. The Occupational Medicine Clinic (Building 207), located near the Gate 1 (Green Street), is the only medical facility situated away from the community center.

12) Open Space/Buffer Zone. Open space may be undeveloped for three main reasons: 1) it is necessary to act as a buffer between incompatible land uses, 2) it is undevelopable due to environmental or physical constraints, or 3) it is required for safety clearances, security areas, and utility easements. Open space at Robins AFB (69 acres, 1% of total base area) is found along the western side of the base, providing a buffer between the base and SR 247, and along the eastern side of the airfield.

13) Outdoor Recreation. A wide variety of outdoor recreational facilities are included in the outdoor recreation land use category. The three basic types of outdoor recreation spaces, as defined in the *Land Use Planning Bulletin* (USAF, 1986), are neighborhood, low density, and intensive use recreation areas. Outdoor recreation areas at Robins AFB (589.5 acres, or 8.3% of total base area) are located near housing and in proximity to all three lakes. The largest outdoor

recreation facility is the Pine Oaks golf course, which is centrally located and acts as a buffer between some housing areas and industrial uses. Other outdoor recreation facilities include the horse stables, campgrounds, Pine Oaks walking trail, nature trails, and archery club all located in the southern part of the base.

14) Water. Water land use includes 45.8 acres of lakes, ponds, and major streams (0.6% of total base area). There are three lakes on Robins AFB: Duck Lake is centrally located, surrounded by housing and outdoor recreation land uses; Lake Luna and Scout Lake are located in the southeast part of the base. There are three main creeks on Robins AFB: Sandy Run Creek on the southern border; Horse Creek on the east side of the base; and Echeconnee Creek, which crosses the extreme northern tip of the base. Also included in the water land use category are various weirs and retention ponds along the east side of the runway.

7.2 Off-Base Land Use

Robins AFB is located in northeastern Houston County, immediately east of the city of Warner Robins. It is situated mainly to the east of SR 247 and includes a predominantly residential area of approximately 332 acres located just west of the highway within the city limits of Warner Robins. The northern corner of the base is adjacent to Bibb County, and Twiggs County is to the east across the Ocmulgee River. The city of Macon is located approximately 18 miles northwest of the base, in Bibb County.

7.2.1 Adjacent Land Uses

Not relevant to this EA.

7.2.2 Zoning

Not relevant to this EA.

7.2.3 AICUZ Program

Not relevant to this EA.

7.3 References

Geophex, Ltd. (Geophex). 1997. *Current Land Use Assessment, Robins Air Force Base, Warner Robins, Georgia*. Submitted to Directorate of Environmental Management, Division of Environmental Compliance, Robins AFB, Georgia.

U.S. Air Force (USAF). 1986. *Land Use Planning Bulletin*.

8.0 NOISE ENVIRONMENT

8.1 Assessment of the Noise Environment

Robins AFB has conducted noise modeling as part of the Air Installation Compatible Use Zones (AICUZ) study, which contains detailed discussion of noise modeling techniques and results for Robins AFB (USAF, 1993). The AICUZ noise analysis of airports is primarily concerned with identifying off-base areas that encounter elevated noise levels. The most recent noise contour data is presented in the Joint Land Use Study (MGRDC, 2004), which can be found on the web site http://www.mgrdc.org/code/docs/pdf/jlus_info.pdf.

The annual average DNL is a descriptor used by the Air Force to assess exposure to aircraft noise, predict community response to various noise levels, and identify compatible land uses (USAF, 1998). The DNL values for land use planning are 65, 70, 75, and 80+ dB. When DNLs are below 65 dB, no land use restrictions are required. The Air Force suggests no residential development where DNLs are greater than 65 dB. However, if residential dwellings are present where DNLs are greater than 65 dB, it is suggested that the dwellings incorporate noise reduction measures. Commercial and/or retail land use is not compatible where DNLs are above 80 dB, and buildings should incorporate noise reduction measures where DNLs are 70-80 dB. Industrial land use is generally compatible with all DNLs, as are most agricultural and open space land uses.

The base maintains its noise levels in accordance with the Air Force Occupational Safety and Health (AFOSH) program.

8.2 Noise Environment at Robins AFB

The noise environment at Robins AFB is dominated by military aircraft operations, along with numerous aircraft in transit. Light civilian aircraft and civilian cargo planes also operate at Robins AFB on a limited basis (USAF, 1993). Other noise sources such as construction activities or heavy machinery are minor in comparison to the aircraft noise generated on approach, landing, and take-off, and during maintenance-related engine runs.

Most of the land under the noise contours extending off-base is undeveloped, and this land likely will not be developed since it is within the Ocmulgee River floodplain. However, several areas of commercial, industrial, and/or residential development also occur where DNLs are greater than 65 dB. In the city of Warner Robins and in Houston County, areas along US Highway 129 north of Green Street and areas east of US Highway 129 and north of the clear zone for Runway 15 lie within the 65-70 dB contour. Residential dwellings and mobile homes in these areas are considered incompatible land uses unless they incorporate noise reduction measures. Some

residential areas in Bibb County (northeast of the base) also have DNLs of 65-70 dB and 70-75 dB. These areas also are incompatible with residential dwellings and mobile homes unless noise reduction features are incorporated into their design (USAF, 1998).

8.3 References

Middle Georgia Regional Development Center (MGRDC). 2004. *Robins Air Force Base and Middle Georgia 2004 Joint Land Use Study*.

U.S. Air Force (USAF).

1993. *Air Installation Compatible Use Zone (AICUZ) Study for Robins Air Force Base, Georgia*.

1998. *Air Installation Compatible Use Zone (AICUZ) Study for Robins Air Force Base, Georgia* (Volumes I-III).

9.0 SAFETY

Safety refers to those issues that directly affect the protection of human life and property. At Robins AFB, the predominant safety issues involve aviation, munitions, and fire prevention.

9.1 Aviation Safety

9.1.1 AICUZ Program

The Department of Defense (DoD) developed the AICUZ program for military airfields in order to protect aircraft operational capabilities while assisting local governments in protecting and promoting the health and safety of the public. AICUZ reports describe three basic types of constraints that affect or result from flight operations: noise zones (described in Section 3.8), accident potential zones, and height limitations on structures in the vicinity of airfields.

Accident Potential Zones

Accident potential zones are based on statistical analysis of past DoD aircraft accidents. DoD analysis has determined that the areas immediately beyond the ends of the runways and along the approach and departure flight paths have significant potential for aircraft accidents. Based on this analysis, DoD developed three zones that have high relative potential for accidents. The clear zone, the area closest to the end of the runway, is the most hazardous. The overall risk is so high that DoD generally acquires the land through purchase or easement to prevent development. At Robins AFB, the clear zones encompass areas 3,000 feet wide by 3,000 feet long and are within the base boundaries (USAF, 1998).

Accident potential zone I (APZ I) is an area beyond the clear zone that has a significant potential for accidents. APZ I is 3,000 feet wide by 5,000 feet long. Accident potential zone II (APZ II) is an area beyond APZ I that has a measurable potential for accidents. APZ II is 3,000 feet wide by 7,000 feet long. While aircraft accident potential in APZs I and II does not warrant acquisition of these areas by the Air Force, land use planning and controls are strongly encouraged in these areas for the protection of the public. Section 3.7.2 describes the actions taken by local governments, such as property acquisitions and zoning, to increase the safety of the public in APZ areas at Robins AFB.

Airfield Clearance Requirements

Height and obstructions criteria to assure airfield clearance and prevent hindrances to flight operations, defined in Federal Aviation Regulation (FAR) Part 77, impose constraints on Robins AFB operations and facilities as well as off-base development. Imaginary planes and conical surfaces extending above and away from the airfield have been defined and criteria have been established to govern the location and height of structures in the vicinity of the airfield. As a result, no man-made hazardous obstructions exist within clearance zones at Robins AFB. Natural features such as trees, rocks, and terrain irregularities can constitute possible hazards to moving aircraft. Trees that penetrate the applicable imaginary surfaces, such as the glide slope, constitute hazardous obstructions and must be removed or topped 10 feet below the imaginary surface.

9.1.2 Bird/Wildlife Aircraft Strike Hazard (BASH) Program

The potential for bird/wildlife aircraft strikes poses a considerable hazard to aircraft and their crews. The purpose of the *Robins AFB Bird/Wildlife Aircraft Strike Hazard (BASH) Plan* 91-212 is to provide guidance to minimize or eliminate aircraft exposure to potentially hazardous bird strikes, as well as strikes of terrestrial animals on the runway. The plan is reviewed annually. Comments are forwarded to 78 ABW Flight Safety Office (78 ABW/SEF) for coordination. The Office of Primary Responsibility (OPR) for the plan is the 78 ABW/SEF.

The BASH plan is based on hazards from both permanent (non-migratory) bird populations, seasonal (migratory) bird populations, and other animals. Implementation of portions of the plan is continuous, while other portions require implementation as required by increased bird or animal activity in the vicinity of the runway. The hazards to safe flying posed by birds and animals are so varied that no single solution to the bird strike problem exists. Specific actions contained in the plan include:

- Establishment of a Bird/Aircraft Strike Hazard Working Group (BHWG);

- Development of procedures to identify and communicate high hazard situations to aircrews and supervisors and to determine if altering/discontinuing flying operations is required;
- Determination of aircraft and airfield operating procedures to avoid high hazard situations;
- Dissemination of information on specific bird hazards and procedures for avoidance to all assigned and transient aircrews; and
- Elimination, reduction, or control of environmental factors that attract birds or animals to the airfield. Because birds or other animals usually are attracted in numbers by the existence of standing water, vegetative cover (trees, shrubs, tall grasses), or landfills, the base is working to eliminate these attractions in the vicinity of the runway.

9.2 Munitions Safety

Not relevant to this EA.

9.3 Fire Protection

Not relevant to this EA.

9.4 References

Not relevant to this EA.

10.0 SOCIOECONOMIC RESOURCES

In 1994, Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was issued to focus attention of Federal agencies on human health and environmental conditions in minority and low-income communities. In addition, EO 12898 aims to ensure that disproportionately high and adverse human health or environmental effects on these communities are identified and addressed.

Based on review of U.S. Census Bureau data (U.S. Census Bureau, 2010), RAFB has a minority population greater than 40 percent and less than 5 percent of RAFB is below poverty level. The majority of the area adjacent to RAFB has a minority population of approximately 40 percent and greater than 13 percent of the area adjacent to RAFB is below poverty level (U.S. Census Bureau, 2010). Houston County has a minority population of approximately 36 percent and approximately 11 percent of Houston County is below poverty level (U.S. Census Bureau, 2010).

In 1997, EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, was introduced to minimize environmental health and safety risks to children. EO 13045 prioritized the identification and assessment of environmental health risks and safety risks that

may affect children and to ensure that Federal agencies, policies, programs, activities, and standards to address environmental risks and safety risks to children.

According to Houston County Environmental Health Department, RAFB does not have any known environmental health and safety risks to children (Stewart, 2005).

The city of Warner Robins, Houston County, and the remaining Macon-Bibb County Standard Metropolitan Statistical Area (SMSA) constitute one of Georgia's fastest growing urban areas. From a town of 52 in 1940, before construction began on Robins AFB in 1941, Warner Robins had grown into a regional center of approximately 43,726 persons by 1990. During that time, the population of nearby Macon nearly doubled from 57,865 in 1940 to 106,210 in 1990 (MGRDC, 1994). The population of Warner Robins had grown to approximately 48,804 by the end of 2002 (WRMPO, 2005). According to the 2010 Economic Impact Statement the resident population (military and dependents) at Robins AFB is 2,965 (RAFB, 2010). The 2009 population of Houston County was estimated to be 135,715 and the nearby counties of Bibb and Twiggs had estimated populations of 156,060 and 10,111, respectively (U.S. Census Bureau, 2010).

The primary mission of Robins AFB, providing logistical support for the Air Force, requires substantial industrial activity and manpower requirements at the base. Robins AFB is the largest industrial complex in Georgia, containing 4.2 million square feet of maintenance shops, 1.8 million square feet of administrative space, 3.3 million square feet of storage space, 92.5 miles of roads (74.5 miles of which are paved), and 13 miles of railroad track. The runway is the largest in Georgia (12,000 feet long by 300 feet wide, with two 1,000-foot overruns). In addition to military and industrial facilities, Robins AFB includes a community which contains more than 1,400 family housing units and dormitories to accommodate 4,948 residents. Base residents are supported by services that include a 20-bed hospital, commissary, base exchange, bank, post office, library, chapel, recreational facilities, theater, and two elementary schools. In 2005, the replacement value of Robins AFB facilities was estimated to be \$5.2 billion (RAFB, 2005).

Over the period 1995-2010, the number of personnel employed at Robins AFB has gradually increased from 17,022 (12,409 civilian and 4,613 military) in 1995 to 20,938 (14,324 civilian and 6,614 military) in 2010. This resulted in an overall increase of 23 percent in total employment, including a 15 percent increase in civilian personnel and a 43 percent increase in the number of military employees (RAFB, 2010). Houston County is the residence of the vast majority (71 percent) of base employees, followed by Bibb County (11 percent) and Peach County (4 percent). The remaining 14 percent of employees live in other counties, none supporting more than two percent of the workforce. Currently, Robins AFB employs a workforce of approximately 21,000 civilian and military personnel.

In fiscal year 2009, the base payroll, representing the combined gross salaries of all military and civilian employees, totaled approximately \$1.6 billion. Both military and civilian salary totals have increased steadily since 1995 (\$740.7 million). The standard Air Force calculation of the economic impact of Robins AFB on Middle Georgia includes an annual payroll of \$1.6 billion, annual expenditures of \$282 million, and an estimated dollar value of indirect jobs created of \$1.6 billion (based on a job multiplier of 2.51). Including retiree payroll, the total annual impact was approximately \$4.1 billion in 2009 (RAFB, 2010).

10.1 References

Middle Georgia Regional Development Center (MGRDC). 1994. *Robins Air Force Base and Middle Georgia Joint Land Use Study 1994*. Macon, Georgia.

Robins AFB (RAFB). 2010. *Economic Impact Statement 2010*. Public Affairs Office and Comptroller Squadron of the 78th Air Base Wing, Robins Air Force Base, Georgia.

U.S. Census Bureau. 2010. *State and County Quickfacts*. Information gathered from internet site, <http://www.census.gov/>.

Warner Robins Metropolitan Planning Organization (WRMPO). 2005. URL: <http://warner-robins.org/>.

11.0 INFRASTRUCTURE

The infrastructure of Robins AFB provides an overview of existing utilities (water supply, wastewater collection and treatment systems, and energy distribution systems) and transportation systems.

11.1 Water Supply System

11.1.1 Existing Conditions

The existing water system consists of water supply wells, water pumping stations, treatment equipment, and distribution piping (approximately 625,000 feet with the main supply in a loop configuration). It serves military, civilian, and contractor personnel and provides necessary water for the base's workload. All water supplied to the base is derived from groundwater wells located on the base. Robins AFB is permitted to operate their water system under the state of Georgia Permit No. CG1530042.

Currently, there are seven groundwater wells on Robins AFB. Six of these wells are in use for supplying the potable water system. The capacity of these seven wells is 10.4 million gallons per day (MGD). However, constant use at this rate is not possible due to aquifer and permit

limitations. Individual well capacities are listed in **Table 11-1**. Average water use during 2010 was 1.44 MGD. The current operating permit limits the withdrawal of water to 3.87 MGD (as an annual average) and 5.01 MGD (as a monthly average). Well No. 19 is offline due to contaminant levels above the Maximum Contaminant Level (MCL). Even with this well offline, Robins AFB retains a water supply capacity margin of approximately 4.1 MGD from peak month demand levels. The other well, Well No. 12 (capacity of 0.28 MGD), is active and supplies make up water for Luna Lake, but does not supply the base potable water system.

11.1.2 Well Locations

Wells No. 1, 5, 16, and 17 are located in the main part of the base. Each of these wells is connected to water mains by 12-inch pipe. Well No. 1 is located in the central part of the base on Robins Drive across the street from the government gas station. Water produced by Well No. 1 is used for the steam plant chillers, as well as the potable water system. Well No. 5 is located on Robins Parkway south of Fifth Street, near military family housing. Well No. 16 is located near the Temporary Living Quarters, and Well No. 17 is located near Gate 1 (Green Street Gate) next to the Civilian Dispensary in the industrial area. Well Nos. 8 and 18 are located away from the main concentration of wells on the base. Well No. 8 is located at the north end of the Flightline East area and is connected to a water main by a 12-inch pipe running along Richard Bay Boulevard. This allows a two way supplementing capability between the Flightline East area and the remainder of the base. Well No. 18 is located at the north end of the runway and is connected by a 12-inch pipe to a 30-inch main. Well No. 19 is located south of Marchbanks Road on Macon Street and is connected by a 12-inch pipe into an 8-inch main.

11.1.3 Water Treatment

Not relevant to this EA.

11.1.4 Supply Control

Not relevant to this EA.

11.1.5 Storage Tanks

Not relevant to this EA.

11.1.6 Planned Improvements

Not relevant to this EA.

11.1.7 Assessment

Not relevant to this EA.

11.2 Sanitary Sewer System

11.2.1 Existing Conditions

The sanitary sewage treatment system includes a collection system (combination of gravity feed and force mains) and a treatment plant. The sanitary treatment facility consists of Sanitary Treatment Plants (STP) No. 1 and No. 2. Sanitary Treatment Plant No. 1, constructed in 1975, processes all of the sanitary wastewater flow on the base. Sanitary Treatment Plant No. 2 has been inactive since 1979. All base operations (including industrial, housing, and food services) contribute wastewater to the sanitary sewer system. There are no off-base areas connected to the sanitary sewer collection system.

11.2.2 Collection System

The sanitary sewerage collection system includes over 48 miles of gravity sewers, approximately 45 sanitary wastewater lift stations, and 13 miles of force main. Each lift station has two pumps, and the pumps range from 1 to 40 horsepower. Pipe sizes range from 4-inch to 18-inch mains and are constructed from various materials, including HDPE, PVC, clay tile, and cast iron. The discharge from the industrial wastewater treatment plant #1 is pumped to the head of the sewage treatment plant.

11.2.3 Treatment Plant

Not relevant to this EA.

11.2.4 Planned Improvements

Not relevant to this EA.

11.2.5 Assessment

Not relevant to this EA.

11.3 Industrial Wastewater System

11.3.1 Existing Conditions

Robins AFB has two industrial wastewater treatment plants. Discharge into the Ocmulgee River from these two wastewater treatment plants is allowed under the same NPDES permit as the STP (Permit #GA0002852).

11.3.2 Industrial Wastewater Treatment Plant No. 1

Base industrial wastewater is processed through one of two industrial wastewater treatment plants. Industrial Wastewater Treatment Plant (IWTP) No. 1 treats all wastewater from the

industrial area of the base except for the metal plating shops in Building 142. This includes wastewaters from the baking soda water/ high pressure water aircraft paint stripping operations for the various aircraft directorates and other related wastewater generating repair activities. The industrial wastewaters flow through approximately 6,200 feet of service piping, over 65,000 feet of mains, and over 32,000 feet of force mains (a total of over 103,000 feet of industrial wastewater piping). Wastewater from IWTP No. 1 is pumped to the Sanitary Treatment Plant (STP) where it is commingled with the sanitary wastewater flow at the head of the STP. Treated effluent from IWTP No. 1 receives additional treatment at the STP. The STP provides the final treatment for biological oxygen demand (BOD) and chemical oxygen demand (COD) prior to effluent discharge through NPDES outfall No. 009. In 2010, average flow into IWTP No. 1 was 0.20 MGD. The design capacity of IWTP No. 1 is 1.0 MGD.

11.3.3 Industrial Wastewater Treatment Plant No. 2

IWTP No. 2 treats wastewater from the base plating shops in Building 142. The wastewater influent from the plating shops is typical plating waste in that it is acidic and contains high levels of chrome and other trace metals. Treated wastewater is discharged from NPDES outfall No. 008. In 2010, the average flow into IWTP No. 2 was 0.02 MGD. The design capacity of IWTP No. 2 is 0.46 MGD.

The treated effluent from the STP and IWTP No. 2 is collected in a pump station and discharged to the Ocmulgee River through a single outfall.

11.3.4 Planned Improvements

Not relevant to this EA.

11.3.5 Assessment

Not relevant to this EA.

11.4 Electrical System

11.4.1 Existing Conditions

Robins AFB is provided commercial electrical power from Georgia Power Company through three Georgia Power Company substations located on base property. Georgia Power owns and maintains the two, name-plate 20-million Volt-Amp (MVA) transformers located in each substation (total of 120 MVA). Actual rating of the D-Street and Ninth Street stations is 51 MVA and 49 MVA respectively. The third station is located north of Building 2. Robins AFB owns and maintains the switching stations adjacent to the Georgia Power transformers. The

substations are fed from looped 115 kilovolt (KV) transmission lines for improved reliability. The Museum of Aviation and a few other small facilities are supplied power from the Flint Electric Membership Cooperative.

11.4.2 Substations

Not relevant to this EA.

11.4.3 Distribution System

There are approximately 70 miles of overhead and underground power lines. Twenty-one circuits are underground and include about 55 miles or 78 percent of the total distribution lines. Three circuits are overhead and include about 15 miles or 22 percent of the total. Ninety-nine percent of the underground cable is less than thirteen years old. During the past 17 years, the base has spent approximately \$35 million upgrading the distribution system by replacing old underground cable and converting from overhead to underground lines. Also, the reliability of the D Street substation was improved by splitting the bus (the copper bar that carries the current) to better handle an increased electrical load from the 116 ACW (Air Guard Side). An additional circuit was also run around the north end of the base to better serve the 116 ACW complex (AMC side).

11.4.4 Control System

Not relevant to this EA.

11.4.5 Backup Power

Not relevant to this EA.

11.4.6 Planned Improvements

Not relevant to this EA.

11.4.7 Assessment

Not relevant to this EA.

11.5 Central Heating and Cooling Systems

11.5.1 Existing Conditions

Heating and cooling services are provided to Robins AFB by two centralized steam plants, Building 177 (Central Steam Plant) and Building 644, and four centralized cooling plants, Buildings 86, 177, 638, and 2057. Additional localized heating and air conditioning systems serve individual buildings and areas on the base. The localized systems are not considered in the overall utilities planning for the base.

11.5.2 Central Heating System

The central heating system consists of the two main plants serving specific areas of the base. Steam Plant No. 1 is located in Building 177, on Cochran Street between First Street and Richard Ray Boulevard (the center of Robins AFB), and Steam Plant No. 2 is located in Building 644 on Page Road, south of Ninth Street (Southwestern portion of the base).

Building 177 serves the industrial area in the heart of the base providing steam for heating and industrial processes. This plant contains five boilers capable of generating a total of 343.2 million British thermal units per hour (MBtu/hr) of steam. Building 644 provides steam for heating, primarily for the Avionics repair complex centered in Buildings 640, 641, and 645. This heating plant, with a current total capacity of 70.4 MBtu/hr (based on operational boilers only), contains four boilers.

The heating distribution system consists of approximately 143,000 feet of steam mains and hot water condensate mains. Some of the steam and condensate lines are older than 25 years. The lines are predominantly direct-buried, which creates replacement and maintenance problems. The most significant problem with the maintenance of direct buried condensate lines is the difficulty in quickly identifying the existence of an actual problem. The resulting condensate (hot water) losses lead to a decrease in overall system efficiency. There are currently several planned but unfunded projects to replace much of the deteriorated/leaking buried steam and condensate piping.

The two main heating plants are natural-gas fired with No. 2 fuel oil as a backup. The base's natural gas supply is contracted as an interruptible source allowing the base to obtain more favorable rates. During periods of interrupted service (e.g., November and December in CY 2000), a propane/air mix plant, located on the south end of the base, provides an environmentally clean alternative to the natural gas. The airpropane mix plant can also serve as a third emergency backup fuel source. In CY 2000, No. 2 fuel oil, the backup fuel supply, was used primarily by Building 177, with much less usage at Building 644. The No. 2 fuel oil was used only during the months of January, February, November, and December. This backup fuel type is stored on-site at Steam Plant No. 1 (Building 177) in a 250,000-gallon aboveground storage tank (AST), which is located just east of the plant. This AST is supplied through underground piping from the main fuel storage area east of Building 177. Steam Plant No. 2 (Building 644) has an on-site AST for fuel storage with a capacity of 28,000-gallon of No. 2 fuel oil.

11.5.3 Central Cooling System

The cooling system includes four main plants serving specific areas of the base. Building 177 is a manned plant with a total capacity of 9,950 tons provided by five electric powered chillers

(three 1,500-ton, one 750-ton, and one 2,000-ton) and two 1,350-ton natural gas powered chillers. There are two unmanned plants: one at Flightline East (Building 2057, 93rd Air Control Wing area, with one 600-ton unit and two 400-ton units) and one at the Avionics repair complex (Building 638, with three 1,200-ton units, one of the chillers is equipped with dual compressors to handle the cooling load with one compressor operating during off season cooling load for energy savings). A dedicated plant located at Building 80 in the east central part of the base (with two 1,200-ton units and one 600-ton unit) supplies chill water to painting operations in Buildings 50, 54, and 89. The total capacity of the central cooling system in Building 177 is 9,950 tons of chilled water, which supplies the main base industrial area, just as its steam plant counterpart. The chill water distribution system includes 42,240 feet of mains. Chilled water is supplied to 22 facilities from the chilled water plant in building 177.

11.5.4 Planned Improvements

Not relevant to this EA.

11.5.5 Assessment

- Not relevant to this EA.

11.6 Natural Gas System

11.6.1 Existing Conditions

Natural gas is currently supplied to Robins AFB by the city of Warner Robins. Another routine supplier to the base (depending on the current annual contract) is the Atlanta Gas Light Co. Six on-base metering stations and one off-base metering station separate the distribution of industrial facilities and housing areas. Existing gas pressure upstream of the metering stations is approximately 150 pounds per square inch gauge (PSIG). Downstream of the metering stations, pressure is reduced to 50-60 PSIG. Pressure-reducing stations that bring the gas pressure down to approximately 35 PSIG are installed throughout the network to provide necessary pressure to most end users (the housing at Scout Lake has no pressure reducers at this time). Natural gas is distributed throughout the base with approximately 238,000 feet of natural gas main piping. The gas is distributed from the mains to the end user through an additional 67,000 feet of service main piping.

11.6.2 Planned Improvements

Not relevant to this EA.

11.6.3 Assessment

Not relevant to this EA.

11.7 Liquid Fuels Systems

11.7.1 Existing Conditions

The liquid fuels system includes storage tanks, pump houses, and approximately 25,000 feet of pipeline for jet fuel, diesel fuel, and gasoline. These fuels are currently stored at six primary areas of the base. These areas include the Storage Yard (commonly known as the Fuel Farm), Pumphouse 1, Pumphouse 3, the 93rd Air Control Wing Pumphouse, the Steam Plant, Contract Aerospace Ground Support Equipment (AGE) (near Pad 8), and Flightline East AGE. The main storage area, the Storage Yard at the corner of Robins Parkway and Richard Ray Boulevard, has storage capacity for 10.1 million gallons of JP-8 (jet fuel), 1.05 million gallons of DF-2 (diesel), 50,000 gallons of DL-2 (low sulfur diesel), and 45,000 gallons of JPTS (jet fuel with additives). Fuel is delivered to the base by pipeline and tank truck. Bulk JP-8 is transferred directly to the base through a 4-inch diameter pipeline pressurized to greater than 300 psi from a storage facility just south of Macon or is delivered, along with gasoline and diesel, by tank trucks. No fuels are delivered by railroad. The fuels are distributed to the end users via pipeline, hydrant system, tank trucks, or the government fueling station. The pipeline distributes JP-8 to the primary recipient, the Storage Yard, and also to the Georgia ANG fuel facility in the northwest section of the base. The hydrant systems along with tank trucks distribute fuel to the end users. The base fuel distribution piping can be cross connected to maximize operations in the event of any temporary maintenance outages.

11.7.2 Planned Improvements

Not relevant to this EA.

11.7.3 Assessment

Not relevant to this EA.

11.8 Air-Propane Mixing System

Not relevant to this EA.

11.9 Utility Systems Summary

Additional capacity is available for all of the major utilities on base. For seven out of eight of these utilities, excess capacity ranges from 20 percent for electricity to 67 percent for natural gas. The one utility with less excess capacity is cooling for the base, with an excess capacity of 3.4

percent. In general, the base utility systems are in good condition with recent or planned upgrades minimizing the potential impact from aging facilities and/or distribution lines.

11.10 Transportation Systems

11.10.1 Off-Base Transportation System

Not relevant to this EA.

11.10.2 On-Base Transportation System

This section discusses the transportation system on Robins AFB. Transportation data were collected from prior reports and studies, as presented in the Base Comprehensive Plan (RAFB, 1990), as well as from ongoing transportation planning activities at the base.

Roadways

The general layout of the system consists of streets running east-west and north-south, concentrated in the administrative/industrial area between First and Fifth Streets and in the community center area between Seventh and Twelfth Streets. Perimeter Road extends northward from Gate 1 around to the east side of the airfield, with Hannah Road continuing southward to Seventh Street. South Perimeter Road wraps around the southern end of the base, and Page Road parallels SR 247 on the eastern border of the base.

Approximately 27,000 people enter and leave the base on an average workday, not including other vehicle trips associated with base activities. Access to the base is through six gates along the western perimeter of the base. All gates are controlled by military personnel during hours of operation. The gates are located at the major east-west streets: First Street (Gate 1), Watson Blvd (Gate 3), Peacekeeper Way (Gate 4), Fifth Street (Gate 5), and the south end of Robins Parkway (Gate 14). Gate 3 is classified as the main entrance gate and is open 24 hours daily. The visitors' center is located adjacent to this gate.

Robins Parkway is the major north-south artery within the Robins AFB street system, connecting at its south end with Russell Parkway at Gate 14. Gate 3 is located on the west end of Watson Blvd at Byron Street. Traffic control on Robins AFB is maintained by signalized intersections, base security police, and signage. The access road that carries the largest traffic volume entering and leaving the base is SR 247, followed by Watson Boulevard, Green Street, and Russell Parkway.

12.0 WASTE MANAGEMENT

12.1 Solid Waste

12.1.1 Regulations

In 1965, the Solid Waste Disposal Act (SWDA) was passed to improve solid waste disposal methods and eliminate open dumps. In 1976, a portion of RCRA (Subtitle D) directed the EPA to develop national performance standards to ensure that no reasonable probability of adverse effects on health or the environment would result from solid waste disposal facilities or practices. The federal regulations establish the minimum criteria for the operation of solid waste disposal facilities. The EPA requirements are contained in 40 CFR 240 through 244, 257, and 258. The Georgia solid waste management regulations are applicable to Robins AFB. The state and federal solid waste regulations address all aspects of solid waste management, from storage of solid waste in containers prior to collection, to collection and transportation, to design and operation of disposal facilities. All solid waste must be disposed of in a permitted solid waste landfill or in another permitted disposal facility such as an incinerator.

12.1.2 Solid Waste Disposal and Recycling

Solid wastes are generated from all areas of Robins AFB, including base housing, municipal operations, office complexes, industrial facilities, and construction/demolition areas. An *Integrated Solid Waste Management Plan* (ISWMP) has been developed to establish an integrated approach to dealing with solid waste management issues at Robins AFB (Robins AFB, 2010). The approach includes source reduction, recycling and disposal. Solid waste must be disposed of in accordance with Section 01560 Environmental Requirements, and Section 01572 Construction & Demolition Waste Management of the Robins AFB Civil Engineering Specifications. Reuse, recycling, and composting are strongly encouraged. Scrap pipe is recycled through the Base Qualified Recycling Program (QRP) Recycling Center. Solid wastes destined for recycling are collected at various locations on the base in waste-specific containers or are turned in to the DLADS.

Currently, there are no active solid waste disposal areas on base property. A former inert waste landfill, known as Landfill 2, is located on the northwest corner of the base. Solid wastes that cannot be recycled are collected by contractors for transportation to off-base disposal at the Houston County landfill for disposal. Houston County has committed to providing solid waste disposal services to Robins AFB and has a MSW landfill with current permitted capacity of 9 years and a C&D landfill with current permitted capacity of 33 years. Additional capacity could be acquired through expansion of the landfill if appropriate permits were obtained.

The solid waste management program at Robins AFB has a history of compliance with Air Force, state, and federal requirements, and the program has received awards for recent activities related to recycling and solid waste reduction.

12.2 Hazardous Materials and Waste

12.2.1 Regulations

RCRA

The Resource Conservation and Recovery Act (RCRA) originally was promulgated in 1976 to regulate cradle-to-grave management of hazardous wastes. A hazardous waste, as defined under RCRA, is any waste by-product of society that can pose a substantial or potential hazard to human health or the environment when improperly managed; possesses at least one of four characteristics (toxic, corrosive, ignitable, explosively or chemically reactive), or is listed in Code of Federal Regulations, Part 40, Section 261.3 or applicable state or local waste management regulations. Facilities that have managed (after July 26, 1982), currently manage, or will manage hazardous waste (as specifically defined in the RCRA regulations) in a regulated unit (container, tank, surface impoundment, waste pile, land treatment unit, landfill, incinerator, or miscellaneous unit) are subject to the regulatory requirements of RCRA. In 1984, RCRA was amended by the Hazardous and Solid Waste Amendments (HSWA). HSWA expanded the EPA's authority under RCRA to address corrective actions for both on- and off-site releases of hazardous waste or hazardous constituents to all environmental media from sources throughout the facility. These sources are called solid waste management units (SWMUs).

CERCLA

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) was enacted in 1980 to regulate releases of hazardous substances to the environment at uncontrolled hazardous waste sites. Petroleum is excluded from CERCLA unless it contains or is a mixture with a hazardous substance. Conceptually, CERCLA is intended for the management of inactive or abandoned waste sites and, as such, complements RCRA, which is generally applied to operating facilities. The CERCLA response process is defined within the National Contingency Plan (NCP). The application of CERCLA and the NCP to federal facilities is addressed in Section 120 of CERCLA. CERCLA requirements at federal facilities are specific and unique.

12.2.2 Management of Hazardous Materials and Wastes

Robins AFB has implemented a *Hazardous Waste Reduction Plan* (HWRP) (WR–ALC, 2010) that focuses on reducing or eliminating the use of hazardous materials. Reduction of hazardous materials used and hazardous wastes generated is an essential aspect of a successful pollution

prevention program. Three categories of hazardous waste generated at Robins AFB include: process wastes, sludges from wastewater treatment, and excess/expired-shelf-life hazardous materials. Robins AFB is implementing a Hazardous Material Management Plan with the intent of improving the quality of hazardous materials management in each of a material's life cycle phases, from the decision to procure the material through receipt, storage, issue, use and eventual disposition of the material (RAFB, 1996).

12.3 Toxic Materials and Waste

Prior to any renovation and/or demolition activity, an inspection/survey of the affected area for the presence of asbestos-containing material (ACM) and lead-based paint (LBP) is required. All potentially hazardous or contaminated waste must be sampled to ensure it is properly characterized and reviewed by Environmental Management for proper disposal. Wastes contaminated with LBP, ACM, or other hazardous materials at levels below their respective regulatory thresholds require the submission of a Special Waste Acceptance Application with analytical data to Environmental Management in order to obtain preapproval for disposal at Houston County Landfill prior to start of work.

12.3.1 Pesticides

Not relevant to this EA.

12.3.2 Asbestos Containing Materials

A base-wide asbestos survey for friable ACM was completed in March 1988. The known friable Regulated ACM (RACM) then was removed in four phases. Friable RACM has now been removed from approximately 98 percent of base facilities. Friable and non-friable ACM continues to be removed from base facilities through renovation and construction activities. ACM surveying and sampling are included in renovation and construction project activities. Costs for ACM removal also are included in renovation/construction project cost estimates.

12.3.3 Polychlorinated Biphenyls

Not relevant to this EA.

12.4 Contaminated Sites

In accordance with RCRA, the state issued a Hazardous Waste Facility Permit (GA EPD Permit No. HW-064(S)) to Robins SFB on September 29, 1988. The permit was reissued to Robins AFB on September 19, 2008. A total of 79 SWMUs are currently listed in the Robins AFB Hazardous Waste Permit. The Corrective Action Plan (CAP) has been approved and the final Remedy is in

Place (RIP) is in place at all sites. Of the 79 SWMUs, 42 are IRP sites; and of the 42 IRP sites, 31 have received a No Further Action (NFA). Additionally, two AOCs are located on the base.

12.5 References

Robins AFB (RAFB). July 2010. *Integrated Solid Waste Management Plan*.

Robins AFB (RAFB). July 1996. *Pollution Prevention Management Action Plan for Warner Robins Air Logistics Center, Robins AFB, Georgia*. Final Plan. Prepared for Environmental Management Directorate, Robins Air Force Base, Georgia.

Warner Robins-Air Logistics Center (WR-ALC). May 2010. *Hazardous Waste Reduction Plan Robins Air Force Base, Georgia*.

APPENDIX B
AGENCY/PUBLIC CORRESPONDENCE

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**PUBLIC NOTICE
FOR THE
DRAFT ENVIRONMENTAL ASSESSMENT (EA) AND
DRAFT FINDING OF NO SIGNIFICANT IMPACT (FONSI)
FOR THE CONSTRUCTION AND OPERATION OF A SOLAR ARRAY
ON ROBINS AFB**

Robins AFB announces the availability for public review and comment the proposed draft EA and FONSI for the construction of a solar array on the Southwest Perimeter of Robins AFB.

A copy of the proposed FONSI is available for public viewing and comment for the next 30 days in the Centerville Library, 206 Gunn Road, Centerville, Georgia, 478-953-4500. For questions or comments, please contact the 78th Air Base Wing Office of Public Affairs at 478-926-2137 or at the address below:

78 ABW/PA
620 9th Street, Bldg 905, Room 215
Robins AFB GA 31098
DSN 472-1024
Commercial: 478-222-1024, 478-926-2137, FAX: 478-926-5997

120256



**DEPARTMENT OF THE AIR FORCE
78TH AIR BASE WING (AFMC)
ROBINS AIR FORCE BASE GEORGIA**

Doralyn Kirkland
GA Environmental Protection Division
2 Martin Luther King Drive
Suite 1152 E
Atlanta, GA 30334

78 CEG/CEAO
775 Macon Street Building 1555
Robins AFB GA 31098-2201

SUBJECT: Draft Environmental Assessment (EA) And Draft Finding Of No Significant Impact (FONSI) For the Construction and Operation of A Solar Array on Robins AFB.

This letter forwards a proposed action that we would normally send to the Georgia Clearing House, and they would send it to you for review. However, because the Clearing House web site now indicates that we are to send proposed projects directly to potentially interested agencies, we are sending this directly to you for your review and comment.

We request that you review the attached document by 20 Oct 2013. We ask that you make your comments specific and note them on a separate sheet of paper rather than on the pages of the document. If you do not have comments, we request that you let us know via email (mark.hickman@robins.af.mil) to ensure continuity of documentation. If we do not receive your comments by 27 Oct 2013, we will assume that you do not have comments.

If you have any questions, please contact me at (478) 327-8288.

**MARK A. HICKMAN
NEPA Program Manager
78th Civil Engineer Group**

Attachments:

1. Draft EA and FONSI (1 hard copy)



**DEPARTMENT OF THE AIR FORCE
78TH AIR BASE WING (AFMC)
ROBINS AIR FORCE BASE GEORGIA**

Dan Forster
GA Wildlife Resources Division
2070 US 278
Social Circle, GA 30025

78 CEG/CEAO
775 Macon Street Building 1555
Robins AFB GA 31098-2201

SUBJECT: Draft Environmental Assessment (EA) And Draft Finding Of No Significant Impact (FONSI) For the Construction and Operation of A Solar Array on Robins AFB.

This letter forwards a proposed action that we would normally send to the Georgia Clearing House, and they would send it to you for review. However, because the Clearing House web site now indicates that we are to send proposed projects directly to potentially interested agencies, we are sending this directly to you for your review and comment.

We request that you review the attached document by 12 Oct 2013. We ask that you make your comments specific and note them on a separate sheet of paper rather than on the pages of the document. If you do not have comments, we request that you let us know via email (mark.hickman@robins.af.mil) to ensure continuity of documentation. If we do not receive your comments by 17 Oct 2013, we will assume that you do not have comments.

If you have any questions, please contact me at (478) 327-8288.

MARK A. HICKMAN
NEPA Program Manager
78th Civil Engineer Group

Attachments:

1. Draft EA and FONSI (1 hard copy)



DEPARTMENT OF THE AIR FORCE
78TH AIR BASE WING (AFMC)
ROBINS AIR FORCE BASE GEORGIA

78 ABW/CC
620 9th Street, Suite 230
Robins AFB GA 31098-1664

NOV 12 2013

Mr. Willard Steele
Tribal Historic Preservation Officer
Seminole Tribe of Florida
34725 West Boundary Road
Clewiston, FL 33440

RE: Solar Enhanced Use Lease Parcel, Robins Air Force Base (Robins AFB), Georgia

Mr. Steele,

Robins AFB proposes to install a solar array system on a 50-acre tract of previously undeveloped land on base. In 2002, Robins AFB completed an archaeological inventory of the entire Base in accordance with Section 110 of the National Historic Preservation Act (NHPA), and the locations of archaeological sites on Base were identified. The Area of Potential Effect for the proposed action does not contain known National Register of Historic Places-eligible archaeological sites.

Additionally, during August 2013, Robins AFB conducted an Environmental Assessment (EA) of the proposed project, under Title 32, Code of Federal Regulations, Part 989. Its draft findings indicate that no historic properties will be affected. A copy of the draft EA is enclosed (attachment 1), and request your review and comment, as appropriate. Barring the presence of any properties of traditional or cultural importance that you wish to identify, we intend to implement the project per the 2008 Comprehensive Programmatic Agreement (PA, attachment 2, with extension to August 2014).

Should cultural resource materials of any nature be discovered during the course of construction or other activities related to the proposed action, 6 CFR 800.13 and applicable portions of the PA and Robins AFB's Integrated Cultural Resources Management Plan (ICRMP, (attachment 3) would be followed. Inadvertent findings of items of traditional or cultural importance would be promptly and carefully processed and coordinated as applicable under provisions of NHPA, the Native American Graves Protection and Repatriation Act (NAGPRA), and the ICRMP. Tribal consultation would be sought, and the base Cultural Resources Manager and a registered professional archaeologist would conduct or oversee monitoring for such findings across the entire project site, as necessary.

I have designated the Robins Air Force Base Civil Engineer, Mr. Otis L. Hicks, Jr., as the base liaison for correspondence to foster communications between you and Robins Air Force Base; he can be reached at (478) 926-3093. Once you have had an opportunity to review the draft EA and

ICRMP, please send comments you have concerning these documents or any other issues to him at: 78 CEG/CL, 775 Macon St., Bldg 1555, Robins AFB, GA, 31098-1664.

Moreover, if your staff wishes to correspond directly with the Robins Air Force Base Cultural Resources staff, please contact Ms. Andrea Pyron at (478) 327-7438 or at 78 CEG/CEANR, 775 Macon St., Bldg 1555, Robins AFB, GA, 31098-2201.



CHRISTOPHER D. HILL, Colonel, USAF
Installation Commander

3 Attachments:

1. Solar Enhanced Use Lease Parcel EA
2. Comprehensive PA
3. Robins AFB ICMRP



DEPARTMENT OF THE AIR FORCE
78TH AIR BASE WING (AFMC)
ROBINS AIR FORCE BASE GEORGIA

78 ABW/CC
620 9th Street, Suite 230
Robins AFB GA 31098-1664

NOV 12 2013

Ms. Lisa Stopp
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
P.O. Box 746
Tahlequah, OK 74464

RE: Solar Enhanced Use Lease Parcel, Robins Air Force Base (Robins AFB), Georgia

Ms. Stopp,

Robins AFB proposes to install a solar array system on a 50-acre tract of previously undeveloped land on base. In 2002, Robins AFB completed an archaeological inventory of the entire Base in accordance with Section 110 of the National Historic Preservation Act (NHPA), and the locations of archaeological sites on Base were identified. The Area of Potential Effect for the proposed action does not contain known National Register of Historic Places-eligible archaeological sites.

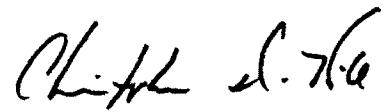
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CHRISTOPHER D. HILL, Colonel, USAF
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DEPARTMENT OF THE AIR FORCE
78TH AIR BASE WING (AFMC)
ROBINS AIR FORCE BASE GEORGIA

78 ABW/CC
620 9th Street, Suite 230
Robins AFB GA 31098-1664

NOV 12 2013

Charles Coleman
Cultural Resources Director
Thlophlocco Tribal Town
P.O. Box 188
Okemah, OK 74859

RE: Solar Enhanced Use Lease Parcel, Robins Air Force Base (Robins AFB), Georgia

Mr. Coleman,

Robins AFB proposes to install a solar array system on a 50-acre tract of previously undeveloped land on base. In 2002, Robins AFB completed an archaeological inventory of the entire Base in accordance with Section 110 of the National Historic Preservation Act (NHPA), and the locations of archaeological sites on Base were identified. The Area of Potential Effect for the proposed action does not contain known National Register of Historic Places-eligible archaeological sites.

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Moreover, if your staff wishes to correspond directly with the Robins Air Force Base Cultural Resources staff, please contact Ms. Andrea Pyron at (478) 327-7438 or at 78 CEG/CEANR, 775 Macon St., Bldg 1555, Robins AFB, GA, 31098-2201.

A handwritten signature in black ink, appearing to read "C. D. HILL 8.7.64".

CHRISTOPHER D. HILL, Colonel, USAF
Installation Commander

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**DEPARTMENT OF THE AIR FORCE
78TH AIR BASE WING (AFMC)
ROBINS AIR FORCE BASE GEORGIA**

78 ABW/CC
620 9th Street, Suite 230
Robins AFB GA 31098-1664

NOV 12 2013

Ms. Natalie Deere
Tribal Historic Preservation Officer
Seminole Nation of Oklahoma
P.O. Box 1498
Wewoka, OK 74884

RE: Solar Enhanced Use Lease Parcel, Robins Air Force Base (Robins AFB), Georgia

Ms. Deere,

Robins AFB proposes to install a solar array system on a 50-acre tract of previously undeveloped land on base. In 2002, Robins AFB completed an archaeological inventory of the entire Base in accordance with Section 110 of the National Historic Preservation Act (NHPA), and the locations of archaeological sites on Base were identified. The Area of Potential Effect for the proposed action does not contain known National Register of Historic Places-eligible archaeological sites.

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Installation Commander

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**DEPARTMENT OF THE AIR FORCE
78TH AIR BASE WING (AFMC)
ROBINS AIR FORCE BASE GEORGIA**

78 ABW/CC
620 9th Street, Suite 230
Robins AFB GA 31098-1664

NOV 12 2013

Mr. Robert Thrower
Tribal Historic Preservation Officer
Poarch Band of Creek Indians
5811 Jack Springs Road
Atmore, AL 35602

RE: Solar Enhanced Use Lease Parcel, Robins Air Force Base (Robins AFB), Georgia

Mr. Thrower,

Robins AFB proposes to install a solar array system on a 50-acre tract of previously undeveloped land on base. In 2002, Robins AFB completed an archaeological inventory of the entire Base in accordance with Section 110 of the National Historic Preservation Act (NHPA), and the locations of archaeological sites on Base were identified. The Area of Potential Effect for the proposed action does not contain known National Register of Historic Places-eligible archaeological sites.

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CHRISTOPHER D. HILL, Colonel, USAF
Installation Commander

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**DEPARTMENT OF THE AIR FORCE
78TH AIR BASE WING (AFMC)
ROBINS AIR FORCE BASE GEORGIA**

78 ABW/CC
620 9th Street, Suite 230
Robins AFB GA 31098-1664

NOV 12 2013

Mr. Emman Stain
Acting Manager
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447

RE: Solar Enhanced Use Lease Parcel, Robins Air Force Base (Robins AFB), Georgia

Mr. Stain,

Robins AFB proposes to install a solar array system on a 50-acre tract of previously undeveloped land on base. In 2002, Robins AFB completed an archaeological inventory of the entire Base in accordance with Section 110 of the National Historic Preservation Act (NHPA), and the locations of archaeological sites on Base were identified. The Area of Potential Effect for the proposed action does not contain known National Register of Historic Places-eligible archaeological sites.

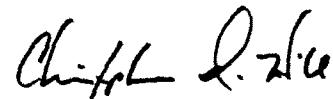
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CHRISTOPHER D. HILL, Colonel, USAF
Installation Commander

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**DEPARTMENT OF THE AIR FORCE
78TH AIR BASE WING (AFMC)
ROBINS AIR FORCE BASE GEORGIA**

78 ABW/CC
620 9th Street, Suite 230
Robins AFB GA 31098-1664

NOV 12 2013

Ms. Marsey Harjo
Tribal Historic Preservation Officer
Kialegee Tribal Town of Oklahoma
P.O. Box 332
Wetumka, OK 74883

RE: Solar Enhanced Use Lease Parcel, Robins Air Force Base (Robins AFB), Georgia

Ms. Harjo,

Robins AFB proposes to install a solar array system on a 50-acre tract of previously undeveloped land on base. In 2002, Robins AFB completed an archaeological inventory of the entire Base in accordance with Section 110 of the National Historic Preservation Act (NHPA), and the locations of archaeological sites on Base were identified. The Area of Potential Effect for the proposed action does not contain known National Register of Historic Places-eligible archaeological sites.

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Moreover, if your staff wishes to correspond directly with the Robins Air Force Base Cultural Resources staff, please contact Ms. Andrea Pyron at (478) 327-7438 or at 78 CEG/CEANR, 775 Macon St., Bldg 1555, Robins AFB, GA, 31098-2201.



CHRISTOPHER D. HILL, Colonel, USAF
Installation Commander

3 Attachments:

1. Solar Enhanced Use Lease Parcel EA
2. Comprehensive PA
3. Robins AFB ICMRP



DEPARTMENT OF THE AIR FORCE
78TH AIR BASE WING (AFMC)
ROBINS AIR FORCE BASE GEORGIA

78 ABW/CC
620 9th Street, Suite 230
Robins AFB GA 31098-1664

NOV 12 2013

Mr. Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719

RE: Solar Enhanced Use Lease Parcel, Robins Air Force Base (Robins AFB), Georgia

Mr. Townsend,

Robins AFB proposes to install a solar array system on a 50-acre tract of previously undeveloped land on base. In 2002, Robins AFB completed an archaeological inventory of the entire Base in accordance with Section 110 of the National Historic Preservation Act (NHPA), and the locations of archaeological sites on Base were identified. The Area of Potential Effect for the proposed action does not contain known National Register of Historic Places-eligible archaeological sites.

Additionally, during August 2013, Robins AFB conducted an Environmental Assessment (EA) of the proposed project, under Title 32, Code of Federal Regulations, Part 989. Its draft findings indicate that no historic properties will be affected. A copy of the draft EA is enclosed (attachment 1), and request your review and comment, as appropriate. Barring the presence of any properties of traditional or cultural importance that you wish to identify, we intend to implement the project per the 2008 Comprehensive Programmatic Agreement (PA, attachment 2, with extension to August 2014).

Should cultural resource materials of any nature be discovered during the course of construction or other activities related to the proposed action, 6 CFR 800.13 and applicable portions of the PA and Robins AFB's Integrated Cultural Resources Management Plan (ICRMP, (attachment 3) would be followed. Inadvertent findings of items of traditional or cultural importance would be promptly and carefully processed and coordinated as applicable under provisions of NHPA, the Native American Graves Protection and Repatriation Act (NAGPRA), and the ICRMP. Tribal consultation would be sought, and the base Cultural Resources Manager and a registered professional archaeologist would conduct or oversee monitoring for such findings across the entire project site, as necessary.

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78 ABW/CC
620 9th Street, Suite 230
Robins AFB GA 31098-1664

NOV 12 2013

Mr. Leland Thompson
Cultural Resources Director
Coushatta Tribe of Louisiana
P.O. Box 818
Elton, LA 70532

RE: Solar Enhanced Use Lease Parcel, Robins Air Force Base (Robins AFB), Georgia

Mr. Thompson,

Robins AFB proposes to install a solar array system on a 50-acre tract of previously undeveloped land on base. In 2002, Robins AFB completed an archaeological inventory of the entire Base in accordance with Section 110 of the National Historic Preservation Act (NHPA), and the locations of archaeological sites on Base were identified. The Area of Potential Effect for the proposed action does not contain known National Register of Historic Places-eligible archaeological sites.

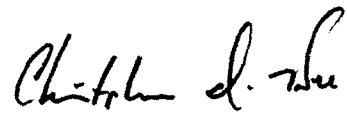
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78 ABW/CC
620 9th Street, Suite 230
Robins AFB GA 31098-1664

NOV 12 2013

Dr. Richard Allen
Tribal Historic Preservation Officer
Cherokee Nation of Oklahoma
P.O. Box 948
Tahlequah, OK 74465

RE: Solar Enhanced Use Lease Parcel, Robins Air Force Base (Robins AFB), Georgia

Dr. Allen,

Robins AFB proposes to install a solar array system on a 50-acre tract of previously undeveloped land on base. In 2002, Robins AFB completed an archaeological inventory of the entire Base in accordance with Section 110 of the National Historic Preservation Act (NHPA), and the locations of archaeological sites on Base were identified. The Area of Potential Effect for the proposed action does not contain known National Register of Historic Places-eligible archaeological sites.

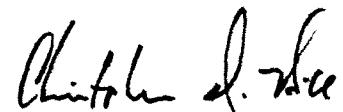
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78 ABW/CC
620 9th Street, Suite 230
Robins AFB GA 31098-1664

NOV 12 2013

Ms. Augustine Asbury
Tribal Historic Preservation Officer
Alabama-Quassarte Tribal Town
P.O. Box 187
Wetumka, OK 74883

RE: Solar Enhanced Use Lease Parcel, Robins Air Force Base (Robins AFB), Georgia

Ms. Asbury,

Robins AFB proposes to install a solar array system on a 50-acre tract of previously undeveloped land on base. In 2002, Robins AFB completed an archaeological inventory of the entire Base in accordance with Section 110 of the National Historic Preservation Act (NHPA), and the locations of archaeological sites on Base were identified. The Area of Potential Effect for the proposed action does not contain known National Register of Historic Places-eligible archaeological sites.

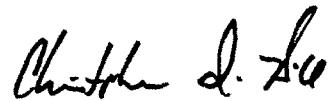
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ROBINS AIR FORCE BASE GEORGIA**

78 ABW/CC
620 9th Street, Suite 230
Robins AFB GA 31098-1664

NOV 12 2013

Mr. Bryant Celestine
Historic Preservation Officer
Alabama-Coushatta Tribe of Texas
571 State Park Rd 56
Livingston, TX 77351

RE: Solar Enhanced Use Lease Parcel, Robins Air Force Base (Robins AFB), Georgia

Mr. Celestine,

Robins AFB proposes to install a solar array system on a 50-acre tract of previously undeveloped land on base. In 2002, Robins AFB completed an archaeological inventory of the entire Base in accordance with Section 110 of the National Historic Preservation Act (NHPA), and the locations of archaeological sites on Base were identified. The Area of Potential Effect for the proposed action does not contain known National Register of Historic Places-eligible archaeological sites.

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Native American Graves Protection and Repatriation Act

AS AMENDED

This Act became law on November 16, 1990 (Public Law 101-601; 25 U.S.C. 3001 et seq.) and has been amended twice. This description of the Act, as amended, tracks the language of the United States Code except that (following common usage) we refer to the "Act" (meaning the Act, as amended) rather than to the "subchapter" or the "title" of the Code.

25 U.S.C. 3001,
Definitions

Section 2

For purposes of this Act, the term—

(1) **"burial site"** means any natural or prepared physical location, whether originally below, on, or above the surface of the earth, into which as a part of the death rite or ceremony of a culture, individual human remains are deposited.

(2) **"cultural affiliation"** means that there is a relationship of shared group identity which can be reasonably traced historically or prehistorically between a present day Indian tribe or Native Hawaiian organization and an identifiable earlier group.

(3) **"cultural items"** means human remains and—

(A) **"associated funerary objects"** which shall mean objects that, as a part of the death rite or ceremony of a culture, are reasonably believed to have been placed with individual human remains either at the time of death or later, and both the human remains and associated funerary objects are presently in the possession or control of a Federal agency or museum, except that other items exclusively made for burial purposes or to contain human remains shall be considered as associated funerary objects.

(B) **"unassociated funerary objects"** which shall mean objects that, as a part of the death rite or ceremony of a culture, are reasonably believed to have been placed with individual human remains either at the time of death or later, where the remains are not in the possession or control of the Federal agency or museum and the objects can be identified by a preponderance of the evidence as related to specific individuals or families or to known human remains or, by a preponderance of the evidence, as having been removed from a specific burial site of an individual culturally affiliated with a particular Indian tribe,

Native American Graves Protection and Repatriation Act

(C) “sacred objects” which shall mean specific ceremonial objects which are needed by traditional Native American religious leaders for the practice of traditional Native American religions by their present day adherents, and

(D) “cultural patrimony” which shall mean an object having ongoing historical, traditional, or cultural importance central to the Native American group or culture itself, rather than property owned by an individual Native American, and which, therefore, cannot be alienated, appropriated, or conveyed by any individual regardless of whether or not the individual is a member of the Indian tribe or Native Hawaiian organization and such object shall have been considered inalienable by such Native American group at the time the object was separated from such group.

(4) “Federal agency” means any department, agency, or instrumentality of the United States. Such term does not include the Smithsonian Institution.

(5) “Federal lands” means any land other than tribal lands which are controlled or owned by the United States, including lands selected by but not yet conveyed to Alaska Native Corporations and groups organized pursuant to the Alaska Native Claims Settlement Act of 1971 [43 U.S.C. 1601 et seq.].

(6) “Hui Malama I Na Kupuna O Hawai‘i Nei” means the nonprofit, Native Hawaiian organization incorporated under the laws of the State of Hawaii by that name on April 17, 1989, for the purpose of providing guidance and expertise in decisions dealing with Native Hawaiian cultural issues, particularly burial issues.

(7) “Indian tribe” means any tribe, band, nation, or other organized group or community of Indians, including any Alaska Native village (as defined in, or established pursuant to, the Alaska Native Claims Settlement Act) [43 U.S.C. 1601 et seq.], which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

Native American Graves Protection and Repatriation Act

(8) “museum” means any institution or State or local government agency (including any institution of higher learning) that receives Federal funds and has possession of, or control over, Native American cultural items. Such term does not include the Smithsonian Institution or any other Federal agency.

(9) “Native American” means of, or relating to, a tribe, people, or culture that is indigenous to the United States.

(10) “Native Hawaiian” means any individual who is a descendant of the aboriginal people who, prior to 1778, occupied and exercised sovereignty in the area that now constitutes the State of Hawaii.

(11) “Native Hawaiian organization” means any organization which—

(A) serves and represents the interests of Native Hawaiians,

(B) has as a primary and stated purpose the provision of services to Native Hawaiians, and

(C) has expertise in Native Hawaiian Affairs, and

shall include the Office of Hawaiian Affairs and Hui Malama I Na Kupuna O Hawai‘i Nei.

(12) “Office of Hawaiian Affairs” means the Office of Hawaiian Affairs established by the constitution of the State of Hawaii.

(13) “right of possession” means possession obtained with the voluntary consent of an individual or group that had authority of alienation. The original acquisition of a Native American unassociated funerary object, sacred object or object of cultural patrimony from an Indian tribe or Native Hawaiian organization with the voluntary consent of an individual or group with authority to alienate such object is deemed to give right of possession of that object, unless the phrase so defined would, as applied in section 7(c) of this Act [25 U.S.C. 3005(c)], result in a Fifth Amendment taking by the United States as determined by the United States Court of Federal Claims pursuant to

Native American Graves Protection and Repatriation Act

28 U.S.C. 1491 in which event the “right of possession” shall be as provided under otherwise applicable property law. The original acquisition of Native American human remains and associated funerary objects which were excavated, exhumed, or otherwise obtained with full knowledge and consent of the next of kin or the official governing body of the appropriate culturally affiliated Indian tribe or Native Hawaiian organization is deemed to give right of possession to those remains.

(14) “Secretary” means the Secretary of the Interior.

(15) “tribal land” means—

(A) all lands within the exterior boundaries of any Indian reservation;

(B) all dependent Indian communities;

(C) any lands administered for the benefit of Native Hawaiians pursuant to the Hawaiian Homes Commission Act, 1920 [42 Stat. 108], and section 4 of Public Law 86-3 [note preceding 48 U.S.C. 491].

25 U.S.C. 3002,
Ownership

25 U.S.C. 3002(a),
Native American
human remains and
objects

Section 3

(a) The ownership or control of Native American cultural items which are excavated or discovered on Federal or tribal lands after November 16, 1990, shall be (with priority given in the order listed)—

(1) in the case of Native American human remains and associated funerary objects, in the lineal descendants of the Native American; or

(2) in any case in which such lineal descendants cannot be ascertained, and in the case of unassociated funerary objects, sacred objects, and objects of cultural patrimony—

(A) in the Indian tribe or Native Hawaiian organization on whose tribal land such objects or remains were discovered;

(B) in the Indian tribe or Native Hawaiian organization which has the closest cultural affiliation with such remains or objects and which, upon notice, states a claim for such remains or objects; or

Native American Graves Protection and Repatriation Act

25 U.S.C. 3002(b),
Unclaimed Native
American remains and
objects

25 U.S.C. 3002(c),
Intentional excavation
and removal of Native
American human
remains and objects

(C) if the cultural affiliation of the objects cannot be reasonably ascertained and if the objects were discovered on Federal land that is recognized by a final judgment of the Indian Claims Commission or the United States Court of Claims as the aboriginal land of some Indian tribe—

(1) [sic] in the Indian tribe that is recognized as aboriginally occupying the area in which the objects were discovered, if upon notice, such tribe states a claim for such remains or objects, or

(2) [sic] if it can be shown by a preponderance of the evidence that a different tribe has a stronger cultural relationship with the remains or objects than the tribe or organization specified in paragraph (1), in the Indian tribe that has the strongest demonstrated relationship, if upon notice, such tribe states a claim for such remains or objects.

(b) Native American cultural items not claimed under subsection (a) of this section shall be disposed of in accordance with regulations promulgated by the Secretary in consultation with the review committee established under section 8 of this Act [25 U.S.C. 3006], Native American groups, representatives of museums and the scientific community.

(c) The intentional removal from or excavation of Native American cultural items from Federal or tribal lands for purposes of discovery, study, or removal of such items is permitted only if—

(1) such items are excavated or removed pursuant to a permit issued under section 4 of the Archaeological Resources Protection Act of 1979, as amended, [16 U.S.C. 470cc] which shall be consistent with this Act;

(2) such items are excavated or removed after consultation with or, in the case of tribal lands, consent of the appropriate (if any) Indian tribe or Native Hawaiian organization;

(3) the ownership and right of control of the disposition of such items shall be as provided in subsections (a) and (b) of this section; and

(4) proof of consultation or consent under paragraph (2) is shown.

Native American Graves Protection and Repatriation Act

25 U.S.C. 3002(d),
Inadvertent discovery
of Native American
remains and objects

(d)(1) Any person who knows, or has reason to know, that such person has discovered Native American cultural items on Federal or tribal lands after November 16, 1990, shall notify, in writing, the Secretary of the Department, or head of any other agency or instrumentality of the United States, having primary management authority with respect to Federal lands and the appropriate Indian tribe or Native Hawaiian organization with respect to tribal lands, if known or readily ascertainable, and, in the case of lands that have been selected by an Alaska Native Corporation or group organized pursuant to the Alaska Native Claims Settlement Act of 1971 [43 U.S.C. 1601 et seq.], the appropriate corporation or group. If the discovery occurred in connection with an activity, including (but not limited to) construction, mining, logging, and agriculture, the person shall cease the activity in the area of the discovery, make a reasonable effort to protect the items discovered before resuming such activity, and provide notice under this subsection. Following the notification under this subsection, and upon certification by the Secretary of the department or the head of any agency or instrumentality of the United States or the appropriate Indian tribe or Native Hawaiian organization that notification has been received, the activity may resume after 30 days of such certification.

(2) The disposition of and control over any cultural items excavated or removed under this subsection shall be determined as provided for in this section.

(3) If the Secretary of the Interior consents, the responsibilities (in whole or in part) under paragraphs (1) and (2) of the Secretary of any department (other than the Department of the Interior) or the head of any other agency or instrumentality may be delegated to the Secretary with respect to any land managed by such other Secretary or agency head.

25 U.S.C. 3002(e),
Relinquishment

(e) Nothing in this section shall prevent the governing body of an Indian tribe or Native Hawaiian organization from expressly relinquishing control over any Native American human remains, or title to or control over any funerary object, or sacred object.

Native American Graves Protection and Repatriation Act

18 U.S.C. 1170,
Illegal trafficking
in Native American
human remains and
cultural items

Section 4

(a) Chapter 53 of title 18, United States Code, is amended by adding at the end thereof the following new section:

Section 1170

“(a) Whoever knowingly sells, purchases, uses for profit, or transports for sale or profit, the human remains of a Native American without the right of possession to those remains as provided in the Native American Graves Protection and Repatriation Act shall be fined in accordance with this title, or imprisoned not more than 12 months, or both, and in the case of a second or subsequent violation, be fined in accordance with this title, or imprisoned not more than 5 years, or both.”

“(b) Whoever knowingly sells, purchases, uses for profit, or transports for sale or profit any Native American cultural items obtained in violation of the Native American Grave Protection and Repatriation Act shall be fined in accordance with this title, imprisoned not more than one year, or both, and in the case of a second or subsequent violation, be fined in accordance with this title, imprisoned not more than 5 years, or both.”

(b) The table of contents for chapter 53 of title 18, United States Code, is amended by adding at the end thereof the following new item:

“1170, Illegal Trafficking in Native American Human Remains and Cultural Items.”

25 U.S.C. 3003,
Inventory for human
remains and associated
funerary objects

25 U.S.C. 3003(a),
In general

25 U.S.C. 3003(b),
Requirements

Section 5

(a) Each Federal agency and each museum which has possession or control over holdings or collections of Native American human remains and associated funerary objects shall compile an inventory of such items and, to the extent possible based on information possessed by such museum or Federal agency, identify the geographical and cultural affiliation of such item.

(b)(i) The inventories and identifications required under subsection (a) of this section shall be—

Native American Graves Protection and Repatriation Act

- (A) completed in consultation with tribal government and Native Hawaiian organization officials and traditional religious leaders;
- (B) completed by not later than the date that is 5 years after November 16, 1990, [the date of enactment of this Act], and
- (C) made available both during the time they are being conducted and afterward to a review committee established under section 8 of this Act [25 U.S.C. 3006].

(2) Upon request by an Indian tribe or Native Hawaiian organization which receives or should have received notice, a museum or Federal agency shall supply additional available documentation to supplement the information required by subsection (a) of this section. The term “documentation” means a summary of existing museum or Federal agency records, including inventories or catalogues, relevant studies, or other pertinent data for the limited purpose of determining the geographical origin, cultural affiliation, and basic facts surrounding acquisition and accession of Native American human remains and associated funerary objects subject to this section. Such term does not mean, and this Act shall not be construed to be an authorization for, the initiation of new scientific studies of such remains and associated funerary objects or other means of acquiring or preserving additional scientific information from such remains and objects.

25 U.S.C. 3003(c),
Extension of time for
inventory

(c) Any museum which has made a good faith effort to carry out an inventory and identification under this section, but which has been unable to complete the process, may appeal to the Secretary for an extension of the time requirements set forth in subsection (b)(1)(B) of this section. The Secretary may extend such time requirements for any such museum upon a finding of good faith effort. An indication of good faith shall include the development of a plan to carry out the inventory and identification process.

25 U.S.C. 3003(d),
Notification

(d)(1) If the cultural affiliation of any particular Native American human remains or associated funerary objects is determined pursuant to this section, the Federal agency or museum concerned shall, not later than 6 months after the completion of the inventory, notify the affected Indian tribes or Native Hawaiian organizations.

Native American Graves Protection and Repatriation Act

(2) The notice required by paragraph (1) shall include information—

- (A) which identifies each Native American human remains or associated funerary objects and the circumstances surrounding its acquisition;
- (B) which lists the human remains or associated funerary objects that are clearly identifiable as to tribal origin; and
- (C) which lists the Native American human remains and associated funerary objects that are not clearly identifiable as being culturally affiliated with that Indian tribe or Native Hawaiian organization, but which, given the totality of circumstances surrounding acquisition of the remains or objects, are determined by a reasonable belief to be remains or objects culturally affiliated with the Indian tribe or Native Hawaiian organization.

(3) A copy of each notice provided under paragraph (1) shall be sent to the Secretary who shall publish each notice in the Federal Register.

(e) For the purposes of this section, the term “**inventory**” means a simple itemized list that summarizes the information called for by this section.

Section 6

25 U.S.C. 3003(e),
Definition of
inventory

25 U.S.C. 3004,
Summary for unassociated
funerary objects,
sacred objects, and
cultural patrimony

25 U.S.C. 3004(a),
In general

25 U.S.C. 3004(b),
Requirements for the
summary

- (a) Each Federal agency or museum which has possession or control over holdings or collections of Native American unassociated funerary objects, sacred objects, or objects of cultural patrimony shall provide a written summary of such objects based upon available information held by such agency or museum. The summary shall describe the scope of the collection, kinds of objects included, reference to geographical location, means and period of acquisition and cultural affiliation, where readily ascertainable.
- (b)(1) The summary required under subsection (a) of this section shall be—
 - (A) in lieu of an object-by-object inventory;
 - (B) followed by consultation with tribal government and Native Hawaiian organization officials and traditional religious leaders; and

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25 U.S.C. 3005,
Repatriation

25 U.S.C. 3005(a),
Repatriation of Native American human remains and objects possessed or controlled by Federal agencies and museums

(C) completed by not later than the date that is 3 years after November 16, 1990, [the date of enactment of this Act].

(2) Upon request, Indian Tribes and Native Hawaiian organizations shall have access to records, catalogues, relevant studies or other pertinent data for the limited purposes of determining the geographic origin, cultural affiliation, and basic facts surrounding acquisition and accession of Native American objects subject to this section. Such information shall be provided in a reasonable manner to be agreed upon by all parties.

Section 7

(a)(1) If, pursuant to section 5 of this Act [25 U.S.C. 3003], the cultural affiliation of Native American human remains and associated funerary objects with a particular Indian tribe or Native Hawaiian organization is established, then the Federal agency or museum, upon the request of a known lineal descendant of the Native American or of the tribe or organization and pursuant to subsections (b) and (e) of this section, shall expeditiously return such remains and associated funerary objects.

(2) If, pursuant to section 6 of this Act [25 U.S.C. 3004], the cultural affiliation with a particular Indian tribe or Native Hawaiian organization is shown with respect to unassociated funerary objects, sacred objects or objects of cultural patrimony, then the Federal agency or museum, upon the request of the Indian tribe or Native Hawaiian organization and pursuant to subsections (b), (c) and (e) of this section, shall expeditiously return such objects.

(3) The return of cultural items covered by this Act shall be in consultation with the requesting lineal descendant or tribe or organization to determine the place and manner of delivery of such items.

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(4) Where cultural affiliation of Native American human remains and funerary objects has not been established in an inventory prepared pursuant to section 5 of this Act [25 U.S.C. 3003], or the summary pursuant to section 6 of this Act [25 U.S.C. 3004], or where Native American human remains and funerary objects are not included upon any such inventory, then, upon request and pursuant to subsections (b) and (e) of this section and, in the case of unassociated funerary objects, subsection (c) of this section, such Native American human remains and funerary objects shall be expeditiously returned where the requesting Indian tribe or Native Hawaiian organization can show cultural affiliation by a preponderance of the evidence based upon geographical, kinship, biological, archaeological, anthropological, linguistic, folkloric, oral traditional, historical, or other relevant information or expert opinion.

(5) Upon request and pursuant to subsections (b), (c) and (e) of this section, sacred objects and objects of cultural patrimony shall be expeditiously returned where—

(A) the requesting party is the direct lineal descendant of an individual who owned the sacred object;

(B) the requesting Indian tribe or Native Hawaiian organization can show that the object was owned or controlled by the tribe or organization; or

(C) the requesting Indian tribe or Native Hawaiian organization can show that the sacred object was owned or controlled by a member thereof, provided that in the case where a sacred object was owned by a member thereof, there are no identifiable lineal descendants of said member or the lineal descendants, upon notice, have failed to make a claim for the object under this Act.

25 U.S.C. 3005(b),
Scientific study

(b) If the lineal descendant, Indian tribe, or Native Hawaiian organization requests the return of culturally affiliated Native American cultural items, the Federal agency or museum shall expeditiously return such items unless such items are indispensable for completion of a specific scientific study, the outcome of which would be of major benefit to the United States. Such items shall be returned by no later than 90 days after the date on which the scientific study is completed.

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25 U.S.C. 3005(c),
Standard for
repatriation

(c) If a known lineal descendant or an Indian tribe or Native Hawaiian organization requests the return of Native American unassociated funerary objects, sacred objects or objects of cultural patrimony pursuant to this Act and presents evidence which, if standing alone before the introduction of evidence to the contrary, would support a finding that the Federal agency or museum did not have the right of possession, then such agency or museum shall return such objects unless it can overcome such inference and prove that it has a right of possession to the objects.

25 U.S.C. 3005(d),
Sharing of information
by Federal agencies and museums

(d) Any Federal agency or museum shall share what information it does possess regarding the object in question with the known lineal descendant, Indian tribe, or Native Hawaiian organization to assist in making a claim under this section.

25 U.S.C. 3005(e),
Competing claims

(e) Where there are multiple requests for repatriation of any cultural item and, after complying with the requirements of this Act, the Federal agency or museum cannot clearly determine which requesting party is the most appropriate claimant, the agency or museum may retain such item until the requesting parties agree upon its disposition or the dispute is otherwise resolved pursuant to the provisions of this Act or by a court of competent jurisdiction.

25 U.S.C. 3005(f),
Museum obligation

(f) Any museum which repatriates any item in good faith pursuant to this Act shall not be liable for claims by an aggrieved party or for claims of breach of fiduciary duty, public trust, or violations of state law that are inconsistent with the provisions of this Act.

25 U.S.C. 3006,
Review committee

25 U.S.C. 3006(a),
Establishment

Section 8

(a) Within 120 days after November 16, 1990, the Secretary shall establish a committee to monitor and review the implementation of the inventory and identification process and repatriation activities required under sections 5, 6 and 7 of this Act [25 U.S.C. 3003, 3004, and 3005].

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25 U.S.C. 3006(b),
Committee
membership

(b)(1) The Committee established under subsection (a) of this section shall be composed of 7 members,

(A) 3 of whom shall be appointed by the Secretary from nominations submitted by Indian tribes, Native Hawaiian organizations, and traditional Native American religious leaders with at least 2 of such persons being traditional Indian religious leaders;

(B) 3 of whom shall be appointed by the Secretary from nominations submitted by national museum organizations and scientific organizations; and

(C) 1 who shall be appointed by the Secretary from a list of persons developed and consented to by all of the members appointed pursuant to subparagraphs (A) and (B).

(2) The Secretary may not appoint Federal officers or employees to the committee.

(3) In the event vacancies shall occur, such vacancies shall be filled by the Secretary in the same manner as the original appointment within 90 days of the occurrence of such vacancy.

(4) Members of the committee established under subsection (a) of this section shall serve without pay, but shall be reimbursed at a rate equal to the daily rate for GS-18 of the General Schedule for each day (including travel time) for which the member is actually engaged in committee business. Each member shall receive travel expenses, including per diem in lieu of subsistence, in accordance with sections 5702 and 5703 of title 5 [United States Code].

25 U.S.C. 3006(c),
Committee
responsibilities

(c) The committee established under subsection a) of this section shall be responsible for—

(1) designating one of the members of the committee as chairman;

(2) monitoring the inventory and identification process conducted under sections 5 and 6 of this Act [25 U.S.C. 3003 and 3004] to ensure a fair, objective consideration and assessment of all available relevant information and evidence;

(3) upon the request of any affected party, reviewing and making findings related to—

Native American Graves Protection and Repatriation Act

(A) the identity or cultural affiliation of cultural items, or
(B) the return of such items;

(4) facilitating the resolution of any disputes among Indian tribes, Native Hawaiian organizations, or lineal descendants and Federal agencies or museums relating to the return of such items including convening the parties to the dispute if deemed desirable;

(5) compiling an inventory of culturally unidentifiable human remains that are in the possession or control of each Federal agency and museum and recommending specific actions for developing a process for disposition of such remains;

(6) consulting with Indian tribes and Native Hawaiian organizations and museums on matters within the scope of the work of the committee affecting such tribes or organizations;

(7) consulting with the Secretary in the development of regulations to carry out this Act;

(8) performing such other related functions as the Secretary may assign to the committee; and

(9) making recommendations, if appropriate, regarding future care of cultural items which are to be repatriated.

25 U.S.C. 3006(d),
Admissibility of
records

(d) Any records and findings made by the review committee pursuant to this Act relating to the identity or cultural affiliation of any cultural items and the return of such items may be admissible in any action brought under section 15 of this Act [25 U.S.C. 3013].

25 U.S.C. 3006(e),
Recommendations
and report

(e) The committee shall make the recommendations under paragraph (c)(5) of this section in consultation with Indian tribes and Native Hawaiian organizations and appropriate scientific and museum groups.

25 U.S.C. 3006(f),
Committee access

(f) The Secretary shall ensure that the committee established under subsection (a) of this section and the members of the committee have reasonable access to Native American cultural items under review and to associated scientific and historical documents.

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25 U.S.C. 3006(g), Duties of the Secretary, regulations, and administrative support	(g) The Secretary shall— (1) establish such rules and regulations for the committee as may be necessary, and (2) provide reasonable administrative and staff support necessary for the deliberations of the committee.
25 U.S.C. 3006(h), Annual report to Congress	(h) The committee established under subsection (a) of this section shall submit an annual report to the Congress on the progress made, and any barriers encountered, in implementing this section during the previous year.
25 U.S.C. 3006(i), Committee termination	(i) The committee established under subsection (a) of this section shall terminate at the end of the 120-day period beginning on the day the Secretary certifies, in a report submitted to Congress, that the work of the committee has been completed.
25 U.S.C. 3007, Penalty assessment, museums	<h2>Section 9</h2> <p>(a) Any museum that fails to comply with the requirements of this Act may be assessed a civil penalty by the Secretary of the Interior pursuant to procedures established by the Secretary through regulation. A penalty assessed under this subsection shall be determined on the record after opportunity for an agency hearing. Each violation under this subsection shall be a separate offense.</p>
25 U.S.C. 3007(a), Penalty	<p>(b) The amount of a penalty assessed under subsection (a) of this section shall be determined under regulations promulgated pursuant to this Act, taking into account, in addition to other factors—</p> <ul style="list-style-type: none">(1) the archaeological, historical, or commercial value of the item involved;(2) the damages suffered, both economic and noneconomic, by an aggrieved party, and(3) the number of violations that have occurred.
25 U.S.C. 3007(b), Amount of penalty	

Native American Graves Protection and Repatriation Act

25 U.S.C. 3007(c),
Legal actions to
recover penalties

(c) If any museum fails to pay an assessment of a civil penalty pursuant to a final order of the Secretary that has been issued under subsection (a) of this section and not appealed or after a final judgment has been rendered on appeal of such order, the Attorney General may institute a civil action in an appropriate district court of the United States to collect the penalty. In such action, the validity and amount of such penalty shall not be subject to review.

25 U.S.C. 3007(d),
Authority to issue
subpoenas

(d) In hearings held pursuant to subsection (a) of this section, subpoenas may be issued for the attendance and testimony of witnesses and the production of relevant papers, books, and documents. Witnesses so summoned shall be paid the same fees and mileage that are paid to witnesses in the courts of the United States.

25 U.S.C. 3008,
Grants

Section 10

(a) The Secretary is authorized to make grants to Indian tribes and Native Hawaiian organizations for the purpose of assisting such tribes and organizations in the repatriation of Native American cultural items.

25 U.S.C. 3008(a),
Grants to Indian tribes
and Native Hawaiian
organizations

(b) The Secretary is authorized to make grants to museums for the purpose of assisting the museums in conducting the inventories and identification required under sections 5 and 6 of this Act [25 U.S.C. 3003 and 3004].

25 U.S.C. 3008(b),
Grants to museums

Section II

25 U.S.C. 3009,
Limitations on applying
the Act

Nothing in this Act shall be construed to—

(1) limit the authority of any Federal agency or museum to—

(A) return or repatriate Native American cultural items to Indian tribes, Native Hawaiian organizations, or individuals, and

(B) enter into any other agreement with the consent of the culturally affiliated tribe or organization as to the disposition of, or control over, items covered by this Act;

(2) delay actions on repatriation requests that are pending on November 16, 1990;

(3) deny or otherwise affect access to any court;

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25 U.S.C. 3010,
Special relationship
between the Federal
Government and
Indian tribes and
Native Hawaiian
organizations

25 U.S.C. 3011,
Regulations

25 U.S.C. 3012,
Authorization of
appropriations

25 U.S.C. 3013,
Judicial jurisdiction
and enforcement

(4) limit any procedural or substantive right which may otherwise be secured to individuals or Indian tribes or Native Hawaiian organizations; or

(5) limit the application of any State or Federal law pertaining to theft or stolen property.

Section 12

This Act reflects the unique relationship between the Federal Government and Indian tribes and Native Hawaiian organizations and should not be construed to establish a precedent with respect to any other individual, organization or foreign government.

Section 13

The Secretary shall promulgate regulations to carry out this Act within 12 months of November 16, 1990.

Section 14

There is authorized to be appropriated such sums as may be necessary to carry out this Act.

Section 15

The United States district courts shall have jurisdiction over any action brought by any person alleging a violation of this Act and shall have the authority to issue such orders as may be necessary to enforce the provisions of this Act.

APPENDIX C
SOLAR GLARE ANALYSIS

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1.0 INTRODUCTION

The potential impact of reflectivity from photovoltaic modules and other facility components is glint and glare (FAA, 2010)¹. Glint is a momentary flash of bright light, whereas glare is a continuous source of bright light. The amount of reflectivity among solar technologies varies greatly, with solar photovoltaic (PV) technology being primarily absorptive rather than reflective. To limit reflection, solar PV panels are constructed of dark, light-absorbing materials and can be covered with an anti-reflective coating. Today's panels reflect as little as 2% of the incoming sunlight depending upon the angle of the sun and the use of anti-reflective coatings. This reflectivity is comparable to that of water surfaces and less than that from bare soil, vegetation, and white concrete.

Glint or glare is a potential hazard or distraction for pilots, air-traffic controllers, motorists and near-by residents. These hazards include the potential for permanent eye injury and temporary disability or distractions such as after-image. Sandia National Laboratories has developed a web-based tool and methodology to evaluate potential glint/glare hazards associated with solar facilities. The Solar Glare Hazard Analysis Tool (SGHAT) is available publicly and can be accessed at www.sandia.gov/glare. The tool provides a quantified assessment of when and where glare will occur, as well as potential ocular impacts.

2.0 SOLAR GLARE HAZARD ANALYSIS TOOL

SGHAT was used to evaluate the potential for glint and glare from the proposed solar PV facilities. The position of the solar PV array of interest was located on a Google map of the Base. Locations on the map (observation points or OPs) were selected for each solar glare analysis (light reflected from the prescribed PV array throughout the year). Latitude, longitude, and elevation are automatically calculated through the Google interface. The following data were specified for the analysis:

Height – Distance above the ground of the solar panels and observation points (OPs).

Orientation of Solar Array – Measured clockwise from true north (0°). Modules facing south would have an orientation of 180°.

Tilt of Solar Panels – Elevation angle of the panels in degrees, where 0° is facing up.

Height of Solar Panels – Distance of the array above the ground.

Reflectivity of Solar Module – Based on observed glare from different PV modules, an average reflectance of 10% is used as a default value in the model.

Slope Error - Based on observed glare from different PV modules, a slope error of ~10 mrad (which produces a total reflected beam spread of 0.13 rad or 7°) is used in the model.

¹ Federal Aviation Administration. 2010. *Technical Guidance for Evaluating Selected Solar Technologies on Airports*. FAA-ARP-TR-10-1. October 2010.

Subtended Angle of Sun – Average subtended angle of the sun as viewed from earth is ~9.3 mrad or 0.5°.

Peak DNI – Maximum Direct Normal Irradiance (W/m²) at the given location at solar noon.

DNI Variability – Scales the peak DNI at each specified time interval based on the changing position of the sun.

Ocular Transmission Coefficient – Typical value of 0.5 is used in the model.

Pupil Diameter – Ranges from 0.002 m for daylight adjusted eyes (the value used in the model) to 0.008 m for nighttime vision.

Eye Focal Length – Typical value of 0.017 m is used in the model.

Time Interval – Time step for the glare analysis. The sun's position is determined at each time step throughout the year. The typical time step used in the model was 1 minute.

The airfield at Robins AFB is oriented on a northwest to southeast axis. Observation points for the glare analysis were selected at three locations along the southeastern approach-departure clearance surface based on UFC 3-260-01 (Class A Visual Flight Rules [VFR] Runway Imaginary Surfaces):

Observation Point	Approach-Departure Surface Location	Distance from Runway End (m/f)	Elevation Above Runway (m/f)
OP1	Beginning of Surface	0 / 0	0 / 0
OP2	Mid-Surface	1,524 / 5,000	38 / 125
OP3	End of Surface	3,048 / 10,000	76 / 250

The result of the analysis is a glare occurrence plot in cases when glare is predicted. The glare occurrence plot shows the date and time when glare could occur and the potential for ocular impact from the glare.

3.0 EUL SOLAR PV ARRAY ANALYSIS RESULTS

For the EUL Solar PV Array, the panels are assumed to be fixed and facing south. The optimum fixed tilt angle of the solar panels was determined to be 27° based on the following calculation:

$$\text{latitude} \times 0.76 + 3.1 \text{ degrees} \text{ (Landau, 2012)}^2$$

Results of the analysis showed that no glare was predicted at any of the OPs along the approach-departure clearance surface over the course of a full year. Results of the analyses by observation point are shown in the attached tables.

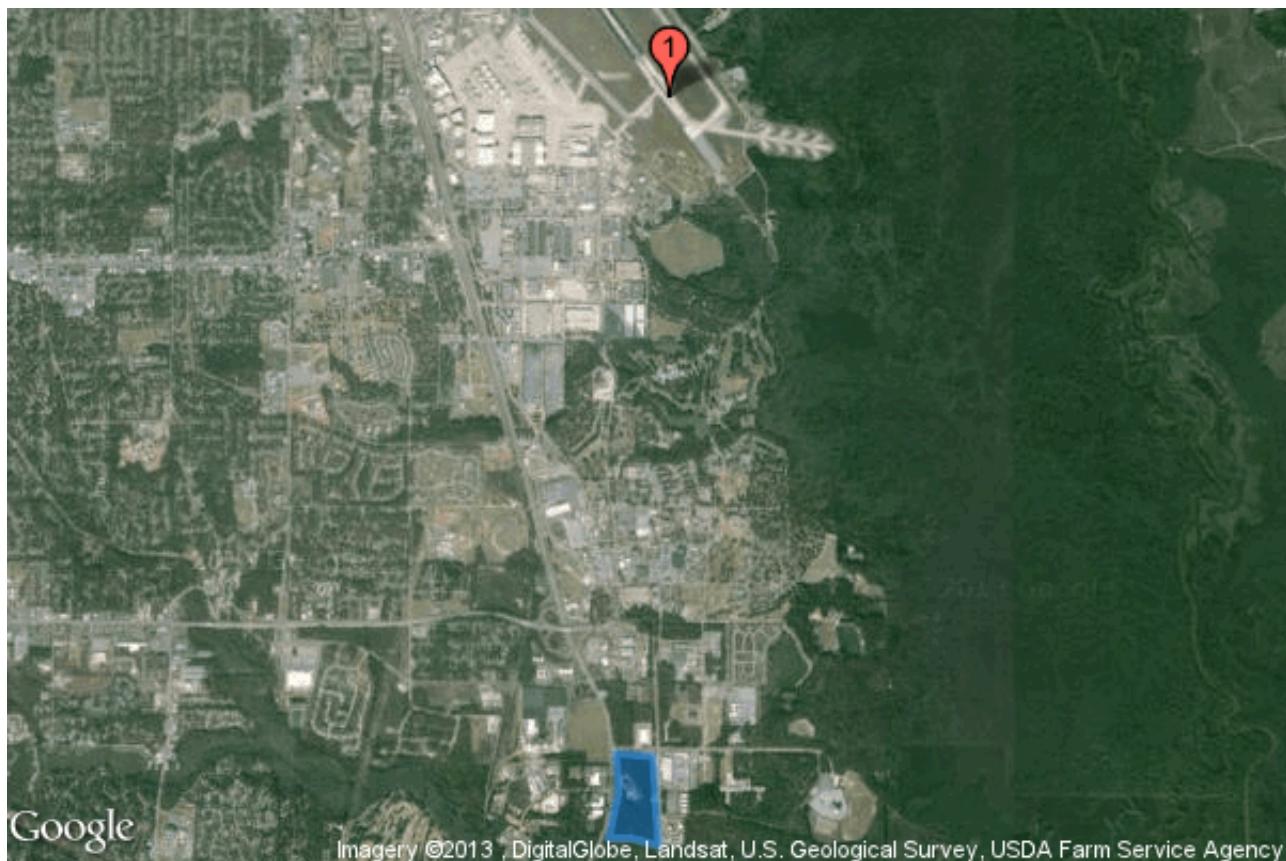
² Charles A. Landau. 2012. Optimum Tilt of Solar Panels. Available on the internet at www.macslab.com/opt solar.html; Accessed on 6/15/2013.

Solar Glare Hazard Analysis Report

Generated July 14, 2013, 1:07 p.m.

No glare found

[Print](#)



Inputs

Analysis name	SPVA_OP1
Orientation of array (deg)	180.0
Tilt of solar panels (deg)	27.0
Height of solar panels (m)	4.0
Rated power (kW)	10000.0
Reflectivity of PV module	0.1

Slope error (mrad)	10.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m ²)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1.0

PV array vertices

Latitude (deg)	Longitude (deg)	Ground Elevation (m)	Ground Elevation (ft)
32.58508	-83.58699	99.11920	325.19424
32.58486	-83.58398	90.73766	297.69573
32.57879	-83.58356	85.26489	279.74047
32.57929	-83.58579	86.05164	282.32167
32.57929	-83.58759	86.64581	284.27105
32.58240	-83.58682	96.51752	316.65853

Observation Points

#	Latitude (deg)	Longitude (deg)	Ground Elevation (m)	Ground Elevation (ft)	Height above ground (m)
1	32.62940	-83.58270	80.97454	265.66451	1

Energy

Maximum energy produced annually, assuming sunny skies every day.

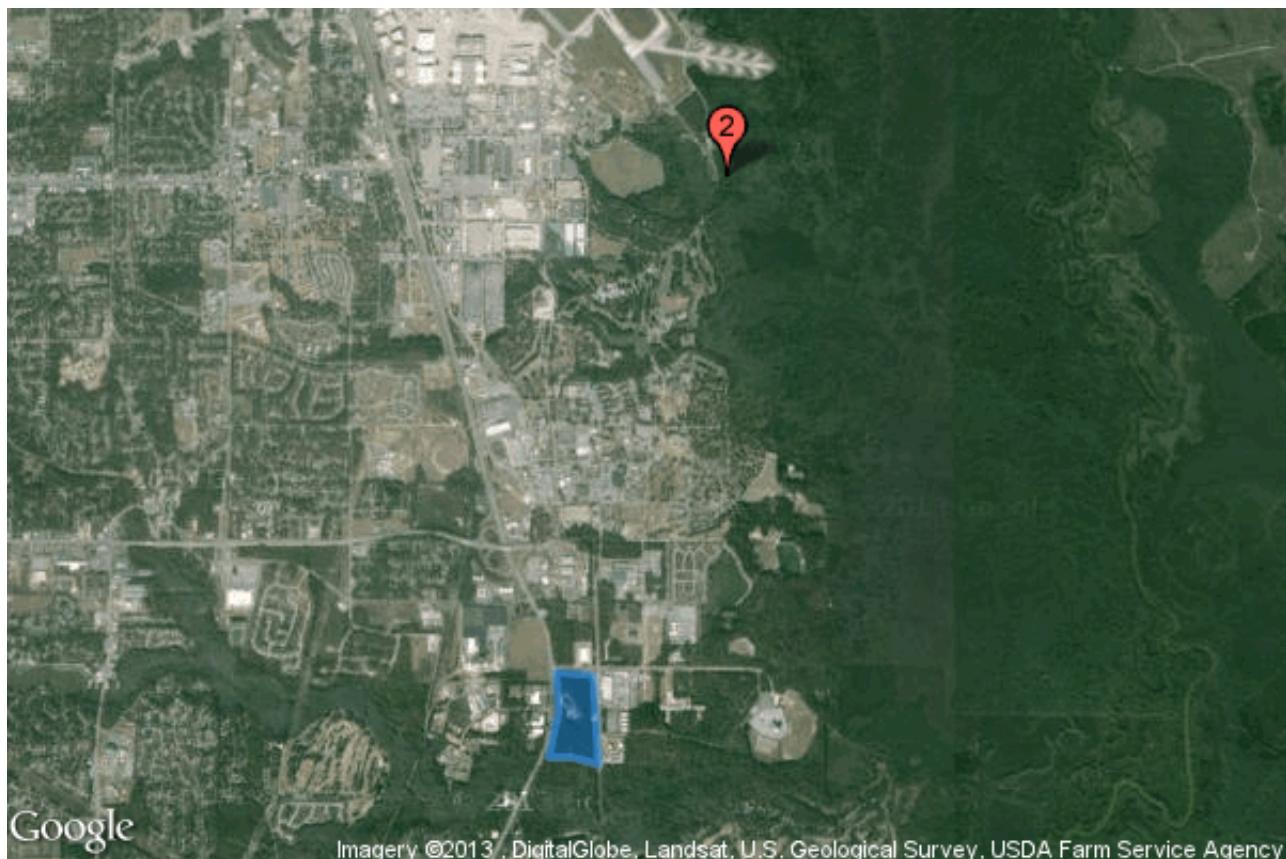
Energy produced annually (kWh)	2.402E+07
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Solar Glare Hazard Analysis Report

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No glare found

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Inputs

Analysis name	SPVA_OP2
Orientation of array (deg)	180.0
Tilt of solar panels (deg)	27.0
Height of solar panels (m)	4.0
Rated power (kW)	10000.0
Reflectivity of PV module	0.1

Slope error (mrad)	10.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m ²)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1.0

PV array vertices

Latitude (deg)	Longitude (deg)	Ground Elevation (m)	Ground Elevation (ft)
32.58508	-83.58699	99.11920	325.19424
32.58486	-83.58398	90.73766	297.69573
32.57879	-83.58356	85.26489	279.74047
32.57929	-83.58579	86.05164	282.32167
32.57929	-83.58759	86.64581	284.27105
32.58240	-83.58682	96.51752	316.65853

Observation Points

#	Latitude (deg)	Longitude (deg)	Ground Elevation (m)	Ground Elevation (ft)	Height above ground (m)
2	32.61856	-83.57326	75.85809	248.87827	38

Energy

Maximum energy produced annually, assuming sunny skies every day.

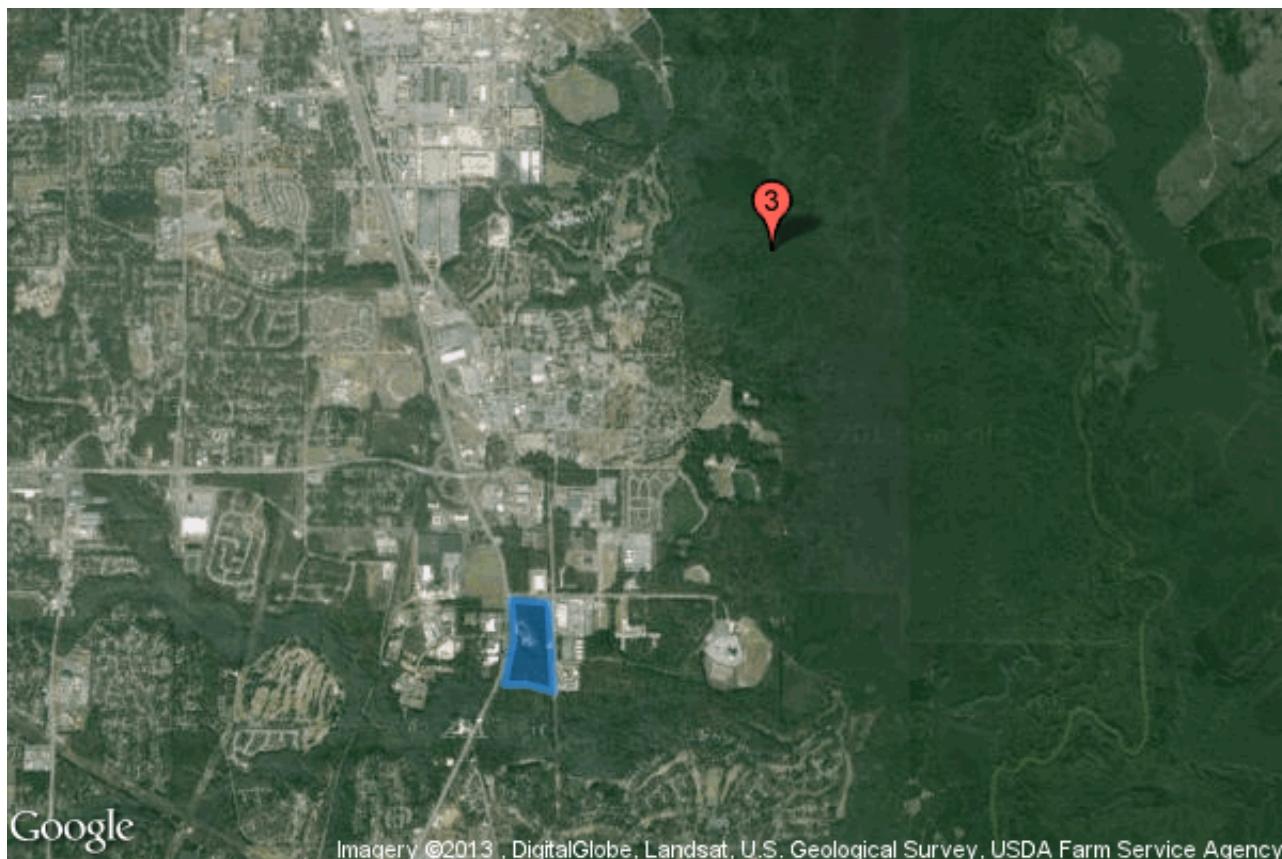
Energy produced annually (kWh)	2.402E+07
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Solar Glare Hazard Analysis Report

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No glare found

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Inputs

Analysis name	SPVA_OP3
Orientation of array (deg)	180.0
Tilt of solar panels (deg)	27.0
Height of solar panels (m)	4.0
Rated power (kW)	10000.0
Reflectivity of PV module	0.1

Slope error (mrad)	10.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m ²)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1.0

PV array vertices

Latitude (deg)	Longitude (deg)	Ground Elevation (m)	Ground Elevation (ft)
32.58508	-83.58699	99.11920	325.19424
32.58486	-83.58398	90.73766	297.69573
32.57879	-83.58356	85.26489	279.74047
32.57929	-83.58579	86.05164	282.32167
32.57929	-83.58759	86.64581	284.27105
32.58240	-83.58682	96.51752	316.65853

Observation Points

#	Latitude (deg)	Longitude (deg)	Ground Elevation (m)	Ground Elevation (ft)	Height above ground (m)
3	32.60851	-83.56596	75.03329	246.17221	76

Energy

Maximum energy produced annually, assuming sunny skies every day.

Energy produced annually (kWh)	2.402E+07
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